Agriculture in the Americas

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IN THIS ISSUE

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Soil Survey

Responding to a request of the Venezuelan government, the Department of Agriculture has sent to that country a group of its technicians, who will survey soil and water conservation problems and submit recommendations on dealing with them. Head of the mission is *Dr. H. H. Bennett,* chief of the Department's Soil Conservation Service. With him are three other representatives of the same Service: *D. S. Hubbell*, research specialist, of Mexican Springs, N. Mex.; *William X. Hull,* Southern Great Plains regional engineer from Amarillo, Tex.; and *James E. Caudle,* soil scientist assigned to the Spokane, Wash., region. The survey began in December, will last 3 or 4 months.

Student Visitors

To provide background in agriculture, the University of São Paulo, Brazil, each year arranges a trip to a foreign country for students in its agricultural branch, the Escola Superior de Agricultura Luis de Queiroz at Piracicaba, making the experience a graduation requirement. Usually the visit is to another Latin American country. In 1941, through a special arrangement, the youthful Brazilians saw the United States. Fifty students and instructors made up the group which spent the month of December in this country. With frequent stops to visit agricultural colleges, experiment stations, and just plain farms, they traveled as far west and south as Texas before returning home to classrooms and impending graduation.

Survey Mission Returns

Back from Peru are *B. Y. Morrison* and *B. B. Robinson*, Department of Agriculture plant scientists, who made a survey of that country's agricultural potentialities for the Peruvian government, to which they will report. Both are on the staff of the Bureau of Plant Industry. Their return brings to eight the number of such surveys completed since an organized program for expanded tropical crop production in Latin America was undertaken.

New Staff Member

Latest addition to the staff of the Division of Latin American Agriculture, Office of Foreign Agricultural Relations, is *Dr. Ross E. Moore*, agriculturist, who comes from the Department of Agriculture's Regional Salinity Laboratory in California. Engineer and soil scientist, Dr. Moore has spent 12 years in Central and South America. In December, he left for the West Indies and northern South America to visit agricultural experiment centers and Department of Agriculture missions in that area.

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Fighting the Pink Invader

How the farmers and the governments of Mexico and the United States have joined forces in the Rio Grande Valley in a battle to eradicate the pink bollworm, most persistent and damaging of the insect enemies of cotton.

by WILLIAM L. WICKLINE

Down in the cotton fields along the Rio Grande, "embattled farmers" of Mexico and Texas are allied in a deadly serious war against the most dread foe of the cotton plant, the pink bollworm. At stake is the future of cotton in one of the leading producing areas of the Western Hemisphere. If the human army wins, no small part of the credit will belong to one of the most potent of inter-American alliances—an agreement between Mexico and the United States for joint action against the pest.

The odds are in favor of the farmers, but it is not a one-sided affair, for the pink bollworm, a master of fifth-column tactics, must be not only outfought, but almost literally outthought. Flying by night, hiding in cottonseed, and even stowing away on shipboard, the pink invader holds all records among mankind's uninvited guests for persistence and resourcefulness.

The boll weevil has long been cotton's Enemy No. 1 in the United States, but so far as world-wide cotton destruction is concerned, it is a mere also-ran to the pink bollworm, which in most cotton-producing countries destroys around a third of the crop every year. Establishment of both these pests at the same time in the United States cotton belt would be no less than a catastrophe.

The pink bollworm (not to be confused with the common bollworm) is known to science as *Pectinophora gossypiella* Saunders. It has been damaging the world's cotton crops for a century. Believed to be a native of Africa, the pest was first found securely established in the wild cotton of India in 1842. By 1906, it had made itself at home in Egypt and from that commercial crossroads launched its career as a world traveler.

Concealed in cottonseed, it slipped into Brazil. Soldiers brought it to Australia in 1923, hidden in cotton pillows. It was brought into the Isle of St. Croix in the Virgin Islands and into Puerto Rico in cottonseed imported for experimental purposes. Mexico acquired the pest directly from Egypt in cottonseed imported in an effort to improve the Mexican varieties. From there, the invader began its attempts to cross the Rio Grande into the United States.

This is the formidable pink bollworm, enlarged to about seven times its normal size.

In 1915, following one of the most destructive hurricanes in the history of the south, the pest was deposited at several points along the Texas and Louisiana coasts, riding out the storm safely in bales of Mexican cotton believed to have been swept overboard from ships and Wharves in the Galveston area. It later became established in both wild and cultivated cotton in Florida, perhaps by night flight of the moths from the West Indies.

On these occasions, since no effective poison dust or spray was known, farmers in the infested areas simply stopped growing cotton for several years and the worms starved to death. This was one hundred percent effective as an eradication measure but naturally it was extremely costly.

Near the close of the first World War, in 1918, the pink bollworm succeeded in crossing the Rio Grande and establishing a base from which it has not yet been wiped out. This time the pest moved from the La Laguna region of Mexico to the isolated Presidio Valley along the Texas border by night flight of the moths, which took

advantage of the prevailing winds into the United States. In 1936, it was found in the lower Rio Grande Valley. From these United States bases, it slipped farther north in Texas and into parts of New Mexico and Arizona, until now it has been found in cotton over an area almost as large as Georgia and Alabama combined.

With the arrival of the pest in full force along the border of the United States, the Department of Agriculture organized a complete army of agricultural scientists and workers and solicited the cooperation of the Mexican Department of Agriculture and Development. It was soon decided that the best chance of success was to attack the insect through its life cycle. To find the Achilles heel, research laboratories were set to work on captive pink bollworms, subjecting them to every conceivable test and experiment. From this study emerged the insect's life story, and a remarkable story it is of a pigmy's struggle to survive in a world of giants.

The worm itself, although it actually does the damage to cotton, is not the adult of the insect. The adult is a small, shy, brown moth, which flies only at night, usually hides in the daytime, and cannot be lured to death with bright lights or fires. In flight, the moths are sometimes carried to a height of 2,000 or 3,000 feet, thus riding the wind to new territory. They apparently do not eat at all during the two or three weeks they live, and the ordinary poisons are ineffective against them.

Other than flying, the only activity of the moth during its brief life is to lay eggs which hatch into almost microscopic worms. The eggs may be laid on the squares, which are the flower buds of the cotton plant; on the bolls, which follow soon afterward and produce the actual cotton; or on other parts of the growing plant. In any event, as soon as an egg hatches, the worm bores into the cotton boll and seeks its favorite food, the developing cotton lint and seeds. Like its elders, the worm eludes poison, since it feeds only on the inside of the boll. In the process it destroys most of the fiber along with the seed.

The Author

Mr. Wickline, a Texan, was for 3 years stationed at Reynosa, State of Tamaulipas, Mexico, engaged in the pink bollworm eradication campaign, which he describes in this article. He is now a member of the staff of the Office of Foreign Agricultural Relations.

Gas chamber sometimes used to fumigate cotton bales in pink bollworm control.

After two or three weeks of luscious eating, the worm reaches maturity, assumes its characteristic pink color, and is ready to transform itself into a pupa. Sometimes the larva seals itself up inside the cottonseed on which it has been feeding and is harvested along with the cotton. Others drop to the ground, bore an inch or so beneath the surface and spin cocoons. While the temperatures are fairly high the larvae become pupae within a few days after finishing feeding. The moth emerges from the pupa in about a week and the cycle starts all over again. There may be as many as five complete cycles in one growing season.

On the approach of cold weather, however, the worm remains dormant and does not pupate until the following spring. Sometimes it remains in this period of hibernation for two seasons, probably as a throwback to ancient habits developed to carry it over an unusually dry season when cotton was scarce or was not grown at all. That is why an area cannot be freed of the pest by being kept out of cotton for a single year. The pink bollworm has one more card up its sleeve. In case the battle runs too strongly in favor of science, it can live on common okra and several related plants, although it is believed that nothing except cotton would support a pink bollworm population over any considerable period of time.

After research had brought all these facts to light, it became apparent that the surest method of combatting the pest was to deprive the worms of their food and to

remove suitable places for the moths to lay their eggs. The scientific army reasoned that if the fields were cleaned of all cotton plants and crop debris immediately after the harvest and kept clean, many of the hibernating larvae would be destroyed and the larvae still active would be deprived of their food. Also, if no fruiting cotton was available in the spring when the moths emerged, they would die before finding suitable places to lay their eggs. The effect to be sought was a uniform time for planting and post-harvest clean-up by all growers in the infested area.

It is this plan, with some refinements, that has been adopted on the Mexican border. It has been found extremely effective in the Presidio region, and during the past year showed marked effect in the lower Rio Grande Valley on both sides of the river. The system has been proven adaptable to various growing and weather conditions and planting customs.

A further precaution has been to place quarantine stations along all routes leading from an infested zone to prevent the artificial spread of the pest by migrant cotton pickers, who are likely to leave a few bolls of cotton in their pick sacks or seed in their cars and trucks. All cottonseed originating in an infested area is sterilized by heat to kill any larvae that may be hiding in it, and the quarantine stations serve to prevent the movement of untreated seed from an infested zone to a free zone. Even baled cotton is safeguarded and may be moved from the infested areas only under special permit and supervision.

Special machines invented by Department of Agriculture personnel sift the worms from the gin trash and enable inspectors to cover whole States within a short time in their effort to locate new infestations as soon as they occur. A special plow has been devised for use in tropical and semitropical areas, where the cotton plant will grow most of the year unless it is killed. This implement nips the cotton stalks off below the surface of the ground and prevents most of them from sprouting again.

Under the cooperative arrangement between Mexico and the United States, both countries share in the expense of the project. Mexico supplies inspectors and workers and assures adequate legal authority to carry out the program on its side of the Rio Grande.

The entire program has been marked by full cooperation of cotton growers on both sides of the river. Mexican farmers clean their fields just as quickly and keep them clean just as efficiently as their United States neighbors. The international boundary line is, in fact, nonexistent so far as the pink bollworm fight is concerned. Both banks are considered as a single zone, with the same problems and the same interests. The pink invader never bothers about a passport before crossing the river in either direction, and farmers who have had experience with him know it.

Using this special machine, inspectors separate insects from trash left when cotton is ginned, thus determining whether or not an area is infested. In infested areas, all such trash is burned at the gin.

Argentina Is Different

Most of the people live in the cities of this predominantly agricultural nation, which, with the largest middle class in Latin America, has developed a mature culture and a high degree of economic and political stability.

by PHILIP LEONARD GREEN

The average traveler who goes to Latin America in search of so-called exotic atmosphere receives a surprise when he reaches Argentina, a country which exemplifies the danger of generalizing about our neighbors to the south. From its first settlement, Argentina seemed destined for a life somewhat different from that of the northern countries of South America, and four centuries of history have affirmed this destiny.

The Indians who met the first Spaniards to attempt a settlement at the mouth of the La Plata River were not of the placid type often found elsewhere. So vigorously did they resist the white man that much blood was spilled before Spain finally succeeded in establishing a colony on the third attempt.

The situation was a good deal like that found by the English colonists in North America, and it had similar results, for Argentina has practically no Indians today except in the extreme northern part and in certain sections of far southern Patagonia.

Argentina's northern and western regions were settled not by voyagers direct from Europe but by settlers who pressed southward and eastward from Peru and Chile. For a long time during the colonial period Buenos Aires, the magnificent and proud national capital of today, was a minor trading outpost of the Peruvian viceroyalty.

Inhabitants of Buenos Aires were forbidden to trade with British and Netherlands ships plying the Atlantic. All their merchandise had to be sent overland via tortuous roads to Lima, seat of the viceregal government. There it was placed on board ship for Panama, where it was met by mule trains and taken to the Atlantic side for the last lap of the journey to Spain. Goods from the mother country bound for Buenos Aires made the same long trip in reverse.

This unhappy state of affairs gave a distinctly economic base to the dissatisfaction with Spanish rule which soon developed in Argentina, although apparently that was not the only reason the citizens of Buenos Aires wished for separation. Historians recall that when the British invaded Buenos Aires in 1806 the Spanish viceroy ran away to Córdoba with the contents of the public treasury, an incident scarcely calculated to fill the Argentine colonists' hearts to overflowing with regard for the authority of the Spanish crown.

Although the country is chiefly agricultural, about three-fourths of the people live in cities. This is attributed by the Argentine economist Alejandro Bunje to the fact that the great fertility of the prairie soil and the extensive use of farm machinery enable relatively few people to tend the land in farms. Two-thirds of the entire population of Argentina is concentrated in the province of Buenos Aires. About 3,500,000 people out of a total population of 13,000,000 live in the city of Buenos Aires and its immediate environs.

There is, of course, a great deal more to Argentina. Such ancient centers of civilization as Córdoba, Salta, and Tucumán are proud of their colonial background and *gaucho* traditions. They resent the asumption that the *porteño* (resident of the Port of Buenos Aires) represents the typical Argentinian. Nevertheless, it is the spirit of Buenos Aires and its environs which today gives Argentina its most distinctive qualities—the energy and zeal for success which make the country so untypical of the romantic tradition of the Spanish-American civilization found elsewhere in South America.

There are perhaps two chief reasons for this "differentness." One is the fact that there has been very little mixture of blood between the white and Indian races (the traditional *gauchos* of the cattle country who represented somewhat of a mixture are fast disappearing) and the other is the heavy immigration from Europe. More than 5,500,000 European settlers arrived in the country

The Author

Mr. Green is a member of the staff of the Office of Foreign Agricultural Relations. His articles about Bolivia, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Guatemala, and Ecuador have appeared in previous issues.

The port of Buenos Aires from the harbor, with the heart of the city in the background. This port is one of the busiest in the world, handling a wide variety of agricultural and industrial products.

Photos Courtesy Pan American Union.

These falls, formed by the Iguazú River near the Argentine-Brazilian border, rank among Argentina's leading beauty spots. At some points, they have a drop of more than 200 feet.

between 1858 and 1928. As recently as 1914, 30 percent of the people were foreign-born, and the proportion stood at almost 20 percent in 1940. Buenos Aires has been called the most European city in the Americas, blending European and American influences that can be seen in its broad boulevards, imposing skyscrapers, handsome apartment buildings, and well-kept subway. Newspapers in almost every foreign language are sold on the street.

The strong metropolitan influence has given Argentina a larger middle class than any other Latin American republic and has contributed to economic stability. A high percentage of the population is employed in industry, the national wealth per capita is relatively high, and the country has maintained an enviable credit rating in international financial circles.

Divided by Three

The land in Argentina may be divided roughly into three sections. The eastern part of the country, particularly that around Buenos Aires, is by far the most important. Here are the fertile, grassy pampas. Toward the west are the tablelands of the Andes mountains, where farming often requires irrigation. In the south is Patagonia, a semiarid grazing land devoted largely to sheep raising. There is also a subtropical area of relatively minor economic importance in the extreme north. Over most of its area Argentina has the sort of climate that appeals to people from the other temperate regions of the world. For those who like their climate "with all the trimmings" there are health resorts, including the one at Villacencio, which has several radioactive springs.

Many of the country's industrial activities are related to the processing of basic agricultural products. Meat packing is one of the most important. In normal times Argentina's beef exports are larger than those of any other nation. The country normally ranks first as an exporter of corn, linseed, and oats and is a major exporter of mutton, wool, and wheat. Argentina has almost a complete monopoly in quebracho wood and extract. It also contains flour mills, shoe factories, textile mills, and tire factories, and manufactures part of its own furniture, glassware, cement, cotton cloth, linen, woolens, and silk fabrics.

Present Argentine investments in industry amount to one and a half billion dollars, which is about a sixth of the amount invested in agriculture and cattle raising. Although capital is turning more and more to industry, several difficulties still stand in the way of real industrial development of the country. There is practically no native coal or iron, and water power is far from the centers of population. Lacking these, Argentina has been unable to develop on a large scale such of its assets as rich deposits of lead, manganese, petroleum, tin, tungsten, and zinc.

On this subject of industrial expansion, there are two schools of Argentine economic thought. One group believes that the country has a great industrial future. The other, representing the agricultural and pastoral interests of the country, holds that an increase in industrial self-sufficiency, even if feasible, would be against the best interests of the country, since it would tend to close foreign markets for agricultural products. This school believes that Argentina's future lies in the improvement of cattle and dairy products, among other things, rather than in an attempt to win a place in highly competitive world markets for products which the country is not by nature able to produce easily.

During the present world war Argentina has been able to export to the United States certain products which the latter formerly obtained from European sources. It has shipped almost two million dollars' worth of wines and considerable quantities of special cheeses to the United States in this period and has even opened a commercial office in New York City to promote the sale of its products. Modern means of transportation and communication have brought Argentina so close to this country that commerce in all but the most perishable of products is possible. Steamers make the trip between Buenos Aires and New York in from 17 to 26 days, and planes wing the distance in 72 hours. There is also direct telephone service between the two cities.

Not only does Argentina have a number of modern ports through which to maintain its external commerce, but its internal transportation system is excellent. Its railroad network is the best in South America; there are 26,700 miles of track, of which about one-third is owned by the government. Road construction is being promoted energetically, and recently a highway was opened all the way to the famous Iguazú Falls on the Brazilian border.

Scene at Tigre, where farm produce of the Paraná River delta comes to market by boat.

The country is fortunate in the relative political sta-

Argentine Ministry of Agriculture photo.

This is a typical scene in the pampas, where Argentina's most fertile soil is found. Beef cattle are fattened entirely on native grass and alfalfa. Livestock feeding of the sort practiced in the United States is unknown.

bility that accompanies its progressiveness. It has had the secret ballot since 1912, and the people, by and large, constitute a democratically minded electorate that seems to have attained real maturity in its attitude toward political and social questions, a fact which augurs well for the national future. Organized labor is strong and has enrolled nearly two-thirds of the country's 665,000 workers in unions. Naturally, in a country so large and well developed, there are many social problems, but the leaders in government, regardless of party, have shown no reluctance to face them.

Educational Bright Spot

Argentina's reputation as a bright spot in the educational world dates back to the activities of the famed Domingo Faustino Sarmiento, who was Minister to the United States in Lincoln's time and later became president of his country. An ardent admirer of Horace Mann, he employed a number of women teachers from the United States who helped lay the foundation for a system of primary education which has affected strongly the democratic traditions of the Argentine nation.

Now the national government's annual education bill is around 310,000,000 pesos, or about 14 percent of its total budget. In addition, the provinces and municipalities and various private agencies spend about 100,000,000 pesos a year for education. There are 14,000 primary schools with 2,000,000 students, 120 normal schools with 60,000 students, 200 *colegios nacionales* (secondary schools) with 35,000 students, 5 national universities with 32,000 students, and 1,200 private schools with 140,000 students. Apart from these figures, which are impressive enough, Argentina can point to a commendably low illiteracy rate of only 12 percent.

In addition to formal educational opportunities, conditions are favorable for the development of culture in general. Argentina has some of the world's best newspapers, with excellent international news coverage. As in many other Latin American countries, the newspapers offer an outlet for literary work, and there are several excellent magazines which publish some of the best writing now being done in Spanish.

In painting, sculpture, and music Argentina can point to many solid achievements. The La Plata Museum is regarded as having the best natural history collection in Latin America. Argentine art has become favorably known in New York and other centers where collections have gone on loan, and in recent years the country's sculptors and painters have been turning more and more from their earlier European influences to native subject matter and treatment. Some of the most talented sing-

ers appear each winter in Buenos Aires at the Colón Opera House, one of the world's largest.

Argentina leads the Western Hemisphere fashion parade without challenge. Because of the differences in seasons, the latest modes from Europe make their appearance in Buenos Aires 6 months before they are shown in New York. There is a strong British influence on sports.

Argentina and the Hemisphere

The innate love of the Argentine people for the principles of freedom and justice is shown by the country's response to Japan's attack on the United States. Argentina was prompt to declare the United States a non-belligerant and to affirm its own adherence to the agreement of the Havana Conference, describing an attack on any American republic as aggression against all of them. Long before the war spread to the Western Hemisphere, in fact, Argentina had intensified its program of cooperation with the other American republics.

Recently Argentina has been sending a number of its leaders to the United States to tighten the bonds of friendship with this country. Prominent among these has been the group of congressmen headed by Deputy Raŭl Damonte Taborda, chairman of the committee investigating totalitarian activities in Argentina. Delegations of army officers, businessmen, and educators have contributed to bringing the two countries closer together.

In the economic field there are two recent major contributions to relationships between these two American republics. The newly signed trade agreement between Argentina and the United States, often referred to as the result of 72 years of patient negotiation, opens vast opportunities for mutual benefits. In addition the Export-Import Bank has set aside a credit of $20,000,000 to help Argentina keep its economic balance during the emergency.

So far as cultural ties are concerned, Argentina was the first Latin American country to have a bilateral cultural institute to further the exchange between the two countries of mutual knowledge about their civilizations. This organization is known as the Instituto Cultural Argentino-Norte Americano. It has cooperated for many years with the Institute of International Education of New York in the interchange of students and intellectual leaders between Argentina and the United States. It has also given courses in English and provided facilities for the acquisition of books from the United States. Within relatively recent years, other countries have been aided in organizing their own bilateral cultural institutes by some of the techniques developed in Buenos Aires.

To all who hope for a better day in inter-American relations, it is encouraging to find Argentine thought and action so wholeheartedly enlisted in this cause.

Reading
ABOUT THE AMERICAS

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Hands Off: A History of the Monroe Doctrine, Dexter Perkins; 455 pp., Little, Brown & Co., Boston, 1941. Deals with historic background and present-day implications of the Monroe Doctrine. Bibliography.

Statistical Activities of the American Nations, 1940, Elizabeth Phelps, Ed.; 842 pp., Inter-American Statistical Institute, Washington, D. C., 1941. Describes organization of statistical services in the Americas. Summaries at the beginning of each country section, in English and in the language of the country. List of statistical sources.

The United States in World Affairs in 1940, Whitney H. Shepardson and William O. Scroggs; 400 pp., Harper & Brothers for the Council on Foreign Relations, New York, 1941. Latin American sections are Chapter VI, "The Protection of Pan America," and Appendix IV, "The Monroe Doctrine and the War." Maps.

Riches of South America, V. Wolfgang von Hagen; 56 pp., D. C. Heath & Co., Boston, 1941. Stories for young people, on various commodities. Illustrated by Paul Kinnear. (Part of "New World Neighbors" series.)

A Guide to Studies in Spanish American Literature, Nina Lee Weisinger; 120 pp., D. C. Heath & Co., Boston, 1940. Facilitates study of colonial, revolutionary, and modern literature of Spanish America. Chronology.

Latin American Pilots of Destiny, A. Curtis Wilgus; 8 pp. (pamphlet), Educational Research Bureau, Washington, D. C., 1941. Deals with dictators of Latin America historically. (No. 1 of Pan American Series.)

Let's See South America, Anna Witherspoon; 498 pp., The Southern Publishing Co., Dallas, 1939. Travel impressions with a good amount of background material and a liberal sprinkling of photographs.

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Santo Domingo (now Ciudad Trujillo), Dominican Republic, founded in 1496, is the oldest European settlement in the Americas.

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James G. Blaine, as Secretary of State of the United States, was President of the First Pan American Conference in Washington in 1890.

South American Tea

This is a story of *mate,* favorite drink of 10,000,000 South Americans. Brewed from a native Paraguayan leaf, the beverage is making friends in the United States and becoming increasingly important in inter-American trade.

by OCTAVIO CABRAL

Because it tastes good and is stimulating, the tealike beverage called mate is a favorite with millions of South Americans. It is an all-occasion drink—used by cattlemen on the range, by soldiers in camp, and by family groups at social hours. Some 10,000,000 persons are estimated to be regular users of the beverage in central and southern South America, where it occupies a position like that of coffee in the United States or tea in Great Britain.

At present, mate (pronounced MAH-tay) is largely a South American commodity. It is produced only in Brazil, Argentina, and Paraguay, and consumption is chiefly in those three countries, along with Uruguay and Chile. But there are increasing exports to the United States, and these are expected to grow as more North Americans become familiar with its virtues, thus adding another important item to the list of South American agricultural products that complement the production of the United States.

Nobody knows how long mate has been drunk in Latin America. Early in the sixteenth century, Juan de Solís, Spanish discoverer of South America's famed La Plata River, reported that the Guaraní Indians of the Paraguay area brewed from the leaves of certain forest trees an exceptional drink which produced exhilaration and relief from fatigue. The Spaniards, not averse to exhilaration, tried the beverage, liked it, and began to use it more generally than they did imported teas.

Solís was eventually killed by the same Indians from whom he borrowed his breakfast beverage, but the beverage went on to a growing popularity. As the years passed, its reputation extended beyond pioneers and cattlemen and it came to be used by city dwellers, although its greatest use is still in rural areas. In 1865, the same tree was found in the Paraná River region of Argentina, Brazil, and Paraguay, and mate production soon became an important industry for that section of South America.

Strictly speaking, the product's name, in Spanish, is *yerba mate. Yerba* means herb, and *mate* was originally the name of the gourd from which the brew was drunk, a name which came to be applied to the beverage as well. Other of its popular names in various parts of the world are "South American tea" and "Paraguay tea."

The brew is prepared by steeping finely ground leaves in water that is just under the boiling point. In some parts of Latin America it is still drunk from decorated gourds of the same type that gave the product its name. This gourd is known as the *cuia,* and the beverage is sipped through a silver tube and strainer called a *bombilla.* It may, of course, be drunk from a cup like tea or coffee, and sugar or lemon may be added.

It Tastes Like Tea

The beverage is not unlike tea in taste and is of a greenish color. In Brazil a process called "double toasting" has been developed recently to produce a type of mate especially designed to meet the taste of North American palates. This not only gives the beverage a more tangy flavor but produces a brew of amber brown—a color more familiar to tea drinkers. This product is marketed as "Brazil Matte," the extra "t" being a concession to North American eyes and ears to encourage the correct pronunciation. It is prepared for consumption in bags like tea balls, as well as loose in canisters.

Mate is similar in chemical properties to the Oriental teas with which North Americans are familiar. It is recognized by chemists as a stimulant for the muscles and nerves, as well as for the brain. In the first World War it was used by the British, French, and German armies, and the hard-riding Argentine *gaucho* has for years

The Author

Mr. Cabral is Director of the National Matte Institute of Brazil, which has its United States office in New York City. The Institute's program to increase inter-American trade in the product is referred to in the article.

found it a valuable stimulant at intervals in his strenuous work.

Crude mate leaves look a good deal like the familiar Christmas holly and are in fact of the same plant family, some 60 members of which yield leaves used for beverage purposes. They grow on a tree known in scientific parlance as *Ilex paraguayensis,* which sometimes reaches a height of 50 feet, thrives at an elevation of 1,500 to 2,000 feet above sea level, and has graceful, full-leafed branches. A stand of these trees will frequently extend for miles through the forest.

Most forest products fare better when grown in cultivation, but mate is an exception. The wild plant has a distinct aroma and taste that has never been surpassed through plantation cultivation, although the latter method has been attempted in some countries. In Brazil, the leading exporting nation, all production is from wild stands, most of which are found in the relatively humid depressions of the foothills, always accompanied by Paraná pine trees. It is not unusual for one wild tree of this type to yield 65 to 85 pounds of dried leaves under commercial harvesting.

National Matte Institute of Brazil

The South American way of drinking mate is to sip it from a *cuia* through a *bombilla* of silver.

In harvesting the wild product, mate gatherers called *tarrafeiros* or *yerbateros* travel through the jungle searching for a stand of trees, called a *mancha.* If the trees are found on government-owned property, a license to harvest is obtained and the gatherers pitch camp, since the cutting process is slow and they may be in the region for several months. Harvesting is done between May and October, when the tree is in full leaf, and leaves are picked from the same trees only every third year. The harvesters are careful to leave sufficient foliage to protect the ensuing crop.

Only the Tenderest Leaves

Under modern methods in which mate is produced for export, unusual care is taken in harvesting to eliminate all dead or spotty leaves and all dried branches. Only the tenderest leaf tips are used, and all dust and grit are cleaned from the branches. Workers then toast the harvested branches in the open on a platform known as the *sapeco* over a grease- and resin-free fire. After this they are bundled and taken out on muleback to the nearest railroad or to boats for transportation to grinding mills.

In the mills a more thorough cleansing and separation takes place, and the leaves are removed from the branches before they are fed into the grinders. Since fineness of grinding is necessary to release the essences of mate in brewing, the refined product is sieved repeatedly and sent through blowers so as to obtain the finest possible grind without too much powder content. Before sale, mate is ordinarily aged to improve its flavor.

The establishment of cultivated trees involves some problems, since the seeds in their natural state are covered by a gelatinous envelope and an epidermis so stout that at one time it was thought they would sprout only after passing through the stomachs of birds. Under the present system, seeds are gathered as they ripen, soaked in water, crushed with the fingers or with a rolling pin, washed again thoroughly on a fine sieve, and dried in the shade.

The seeds are planted in March in an arbor, are watered daily or oftener, and germinate in September. Young plants are transplanted to wicker baskets and after 18 months are planted a little over a foot apart in fields. These young trees are pruned each year, and the first harvest is in the fourth year, just before the heavy frosts.

The mate-producing countries of Latin America have been accustomed to export around 40 percent of their annual production, but it has gone largely to their immediate neighbors, with negligible exports to Europe and the United States. Producers, naturally enough, are interested in expanding the export market and hope to

National Matte Institute of Brazil

In Argentina's cattle country, mate has a respected place in local traditions. This modern *gaucho* is extending his mate-filled *cuia* to a girl tourist in a gesture of welcome.

acquaint North Americans with the beverage they enjoy so much.

Present United States imports are small in comparison with tea, in spite of the fact that mate is much less expensive than the better-known beverage. In 1939, for instance, the United States imported only 102 thousand pounds of mate, compared with almost 100 million pounds of tea. At the same time, United States mate imports since 1938 have been substantially above what used to be considered normal, evidencing a growing popularity for the beverage.

Since mate is not competitive with any United States product, the United States Government has moved to encourage imports by granting tariff concessions on mate in its trade agreements with Argentina and Brazil. These consisted in cutting the 10 percent duty provided in the Tariff Act of 1930 to 5 percent and then binding the new rate against increase.

The Brazilian Government has responded by organizing the National Matte Institute of Brazil, which is endeavoring to give North Americans every opportunity to become better acquainted with the product. Recently the Institute has distributed large quantities of Brazil Matte in "tea ball" form in the United States. In addition to the beverage, two relatively new mate-flavored products have been introduced—a whole-wheat bread and a carbonated soft drink.

Establishment of a taste for mate in the United States will both add another agricultural product to inter-American trade and enable the Americas to share one more happy social custom.

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Puntarenas, Chile, is the southernmost city on the American Continent.

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El Salvador is the only Central American Republic which does not border on the Atlantic Ocean.

Cuba's Isle of Pines

Something about the history, geography, and agriculture of a Caribbean islet which has managed to remain in the public eye for centuries, more for its historic glamour than for its economic importance.

by PAUL G. MINNEMAN

On a tiny island in an unspecified tropical sea, Long John Silver and the assorted villains and heroes of Robert Louis Stevenson's "Treasure Island" vied for buried wealth. A twin to that island is the Isle of Pines, which lies just south of Cuba, and there are some who believe it is the very island Stevenson had in mind.

Unfortunately, the island is no source of treasure today, but its romantic history has drawn attention to this dot on the map of the Americas out of all proportion to its economic importance, which is slight. It was first known as a hide-out for pirates, then became a penal colony. Later it was settled largely by citizens of the United States, who believed the island would become a United States possession after the Spanish-American War. Continued public interest has been reflected in a large number of inquiries about the island addressed to the Cuban and United States Governments. The most recent discussion has concerned the island's possible use as a center of colonization for European refugees.

Christopher Columbus discovered the Isle of Pines in 1494 and called it *La Evangelista* (The Evangelist). Its modern name comes from the large number of pine trees on the island, an unusual condition for the tropics.

The island has an area of only 1,700 square miles, about the size of the state of Rhode Island. It is only about 25 miles wide at the narrowest point and 45 miles at the widest. Now a part of the Republic of Cuba, it is reached from Havana by an hour's train ride to Batabanó, on the south coast of Cuba, followed by an overnight boat trip to Nueva Gerona, the chief town of the island. The straight-line, overseas distance from Batabanó to Nueva Gerona is 65 miles.

The island's round shape and its three prominent mountains have led to the belief that it is the original "Treasure Island." Certain it is that in olden times treasure-laden Spanish galleons regularly passed near the Isle of Pines. From the newly conquered western world Mexican gold, silver, and jewels were carried to Spain, which in turn sent back money to pay the troops and supplies for the army and the settlers along the western shores of the Caribbean Sea. These treasure-laden ships offered luscious prizes for buccaneers, many of whom made their headquarters on the Isle of Pines. It was not only close to ship routes but offered an excellent hide-out. Larger ships could not safely approach through the shallow waters filled with treacherous hidden coral reefs which surround the island. The swamps and innumerable mangrove-covered islands and keys offered protection from which the pirates could dash out to their prey. At the same time the island's fresh-water springs and rivers and its cattle provided food.

It was used for almost three centuries not only as pirate headquarters but also as a hiding place for their booty, much of which has been found since. Stone forts were built and a central pirate government was established. At times more than 20 armed pirate vessels were anchored in the River Jucaro near Santa Fe. Many ships laden with slaves from Africa also passed nearby, and for a while a large slave market was maintained on the island.

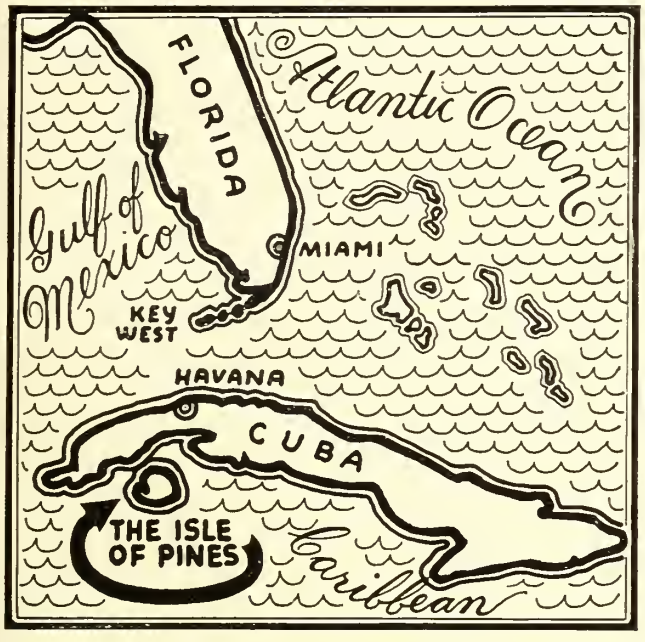
After the pirates were finally driven out about 1830, the island for many years remained undeveloped and was used as a penal colony for Cuban revolutionists against Spain. In 1898 Cuba finally obtained her independence, with the help of the United States, but the treaty that followed the Spanish-American War did not

The Author

Mr. Minneman, a member of the Foreign Service of the State Department, was formerly assistant agricultural attaché of the United States Embassy in London and is now on detail to the Office of Foreign Agricultural Relations. He was a member of the United States technical commission which in 1941 made an agricultural survey of Cuba at the request of the Cuban Government.

specify the disposal of the Isle of Pines, leaving its nationality to be determined later. In the belief that the island would eventually belong to the United States, about 10,000 citizens of this country bought property on the island and at one time held title to about 90 percent of its privately owned land. Only about 1,000 of them really developed their land for vegetables and citrus fruits, however.

The question of nationality was finally settled in 1925, when the United States Senate, after considerable debate, decided that the island rightfully belonged to Cuba, not-



Location of the Isle of Pines, with relation to Cuba and the United States.

withstanding any vagueness of wording in the treaty with Spain and regardless of the fact that many United States citizens had settled there. The Hay-Quesada treaty affirming the Isle's status as a part of Cuba was ratified on March 23, 1925. Even now, many of the island's more than 10,000 inhabitants are United States citizens and many more who came from this country have become Cuban citizens. The North American influence is everywhere apparent in the architecture, shops, churches, roads, vehicles, and newspapers.

A pleasant climate is perhaps the island's greatest asset. The weather is clear and warm the year around, and the facilities for swimming, boating, and fishing make it attractive to tourists. The climate is subtropical and generally similar to that in the southern tip of Florida. The average temperature of the Isle of Pines is about 78 degrees, compared with about 75 degrees at Miami. In the coolest winter months—December, January, and February—the average temperature is 73, and in the peak of summer—June, July, and August—it averages only about 10 degrees higher. Northern winds occasionally cause the temperature in winter to drop as low as 50 degrees, but only for a day or two. Summer heat, rarely above 95, is minimized by pleasant breezes that cross the island.

Like most tropical lands, the Isle of Pines is no place to go without a raincoat. It receives 71 inches of rainfall a year, compared with only 56 in Miami and 57 in New Orleans. About four-fifths of this precipitation falls during the summer months from May to October, when clear mornings are usually followed by heavy afternoon showers and heavy dew at night. Winters are quite dry, which is fine for tourists but no help to winter crops, especially since most of the farm land is sandy and does not hold moisture well.

Although there are about three-fourths of a million acres in the island, less than 7 percent of the area was in use at the time of the 1930 census. The great Lanier swamp divides the island into two parts. The southern section is low—less than 50 feet above sea level—practically uninhabited, and swampy like the Florida Everglades, but covered with mangrove and other tropical forest vegetation. The population is confined to the northern portion, which for the most part has an elevation of less than 200 feet but consists of rolling country with a few abrupt, conspicuous mountains, three of which are about 1,500 feet high and from the distance give the impression that the entire island is mountainous.

Most of the central part of the island is rolling, with well-drained sandy and gravelly soil which is not particularly fertile but responds well to the application of fertilizer and to irrigation. Much of the country is covered with natural pasture and most of the rest consists of forests of pine, royal palm, bamboo, mahogany, Spanish cedar (used in making boxes for Cuba's famous cigars), and a variety of other tropical trees.

Although there are a few towns and villages on the island, its economy is primarily rural. During the winter the tourist trade brings an extra flurry of activity, but the ordinary year-around occupations are farming, lumbering, and sponge and shark fishing. The excellent marble quarries and the small gold mines are worked only occasionally. There are several mineral springs which are widely known for their health properties, but these do not bulk large as commercial enterprises. There is no railroad on the island, and transportation is entirely by road.

The farm crops and fruits are grown in great variety on the island's 500 to 600 farms, but only a few of the products are important for export. Of these, grapefruit, limes, and winter vegetables such as cucumbers, peppers, and eggplant are the most important. Almost all of the

grapefruit exported from Cuba and about 70 percent of the cucumbers come from the Isle of Pines.

Ten to twenty years ago some 200,000 boxes of grapefruit were shipped annually, mostly to the United States, during the late summer months when production in the United States is at its seasonal low. With the rapid expansion of grapefruit production in the United States during recent years, the industry in the Isle of Pines has become much less profitable and has been considerably reduced. Present commercial grapefruit orchards are estimated to cover about 800 to 1,000 acres, and few new plantings are being made.

Much of the winter vegetable production is in the hands of truck farmers on small tracts. At one time tobacco, coffee, and cacao were grown for export, and more recently long-staple cotton has been tried, but none of these is now grown on a commercial scale.

Most of the farms are under 30 acres, but there are a few relatively large cattle ranches. Because of the abundance of pasture on the island, cattle have long been important in its agriculture. The 1940 livestock census showed a cattle population of 15,000, half again as large as the number of human inhabitants. These were mostly native beef cattle.

The economic life of the Isle of Pines has suffered severely since the boom period ended about 15 years ago. People from the United States lost interest when it was finally decided that the island would not become a United States possession and that export products would no longer enjoy the privilege of duty-free entry into the United States. Ships which formerly maintained direct connection with the United States no longer stop at the Island, and now all exports must be sent first by boat and then by train to the port of Havana at greatly increased cost.

In 1926 a disastrous hurricane swept the Island, destroying orchards and buildings. Many of the plantings have never been replaced; land values declined and many farms were subsequently abandoned and sold for taxes. Many of the people from the United States left the Island and have been replaced by Cubans The Island continues to have attraction because of its beauty and its excellent climate, especially in winter, but not as a place to obtain easy profits from farming.

Courtesy Pan American Union.

The Isle of Pines is in some respects primitive and undeveloped, but it has a number of modern buildings. This fine school is in Nueva Gerona, the chief town of the island.

ALONG THE *Agricultural Front*

▲ New Office to Supervise Pan-American Highway

To supervise United States activities in connection with the agriculturally important Pan American Highway, the U. S. Public Roads Administration has established an Inter-American Regional Office and appointed as its chief E. W. James, veteran engineer and all-around enthusiast in the field of inter-American relations ("Agriculture in the Americas," June 1941).

Mr. James' office has compiled and issued an English-Spanish, Spanish-English glossary of bridge, highway, and soil stabilization terms that should be valuable to all inter-American road builders.

▲ Colombian Dairy Industry To Be Improved

Plans for the formation of "La Industria Colombiana de Leches" at Bogotá, Colombia, have been announced. It is the hope of the new association to improve local dairy stock by modern methods of sanitation and hygiene and by importing improved breeding stock.

The organization, the largest of its kind in Colombia, will be backed by the Institute of Industrial Development. The administration of the city of Bogotá will have full control over production of stocks, sanitary conditions, prices, expenses, and other factors affecting consumers.

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Jorge Chávez of Peru was the first aviator to fly over the Alps.

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The Victoria Regia lily of Brazil can support a weight of 50 pounds.

Soil Conservation Service

E. G. HOLT of the Department of Agriculture, who heads the Ecuadoran Economic Resources Mission, now engaged in surveying the resources of that country and advising the government of Ecuador on a program for increased agricultural production. ("Agriculture in the Americas," December 1941.)

▲ Brazilian Bank Establishes Export-Import Bureau

An Export-Import Bureau has been established in the Bank of Brazil to stimulate and assist in the exportation of native products and seek favorable terms for importation of foreign products into Brazil. The Bureau will lend financial aid, where necessary, to producers of exportable merchandise; finance importation of merchandise necessary for domestic industries; purchase and store Brazilian products for export; purchase foreign products essential to Brazilian national economy; and cooperate in financial and trade agreements.

▲ Land Grant College Heads Talk of Latin America

The Association of Land Grant Colleges and Universities of the United States, holding its 1941 annual meeting in Chicago, devoted a session to Latin American agricultural matters. Speakers included: Ricardo Hill, Mexican Consul General in Chicago; Agricultural College Deans Knowles A. Ryerson of California, Homer J. Henney of Colorado, and H. L. Walster of North Dakota; Dr. Earl N. Bressman of the office of the Coordinator of Inter-American Affairs; and J. J. Blandin, vice president of the Goodyear Rubber Plantations Company.

At the close of the meeting the group asked its program committee to arrange an even more extensive inter-American session in 1942.

▲ Mexican Sugar Committee Appointed

A committee to seek means of improving and expanding sugarcane culture in Mexico has been appointed by President Manuel Avila Camacho. The committee, representing the Ministries of Agriculture, Finance, Labor, and National Economy will arrange for federal financial and technical aid in improving cultivation, transportation, and distribution facilities, in addition to regulating wages and prices paid to cane growers.

▲ Latin Grocers To Study U. S. Store Methods

The National Association of Retail Grocers plans to have its grocers' study course, used by the National Grocers Institute, translated into Spanish for distribution to retailers in Central and South America. Arrangements are also being made to issue a Portuguese edition for use by Brazilian grocers. The course will cover store operation, commodity studies, customer relations, salesman-

ship, and grocery merchandising in general.

"Translation into Spanish of an authoritative work on retail grocery store operation in the United States will enable Spanish-speaking grocers to have a better conception of problems faced by their northern neighbors," Edwin P. Geauque, institute director, says.

▲ New Pan American Tomato Developed

Pan America—a new fine quality tomato with high resistance to fusarium wilt (one of the most costly tomato diseases in eastern and southern United States)—is one of the latest achievements of plant breeders in the Department of Agriculture.

The new tomato was developed from a cross between Marglobe, most widely grown in the United States, and a wild species known as the red currant tomato, collected in Peru. The wild parent is practically immune from fusarium wilt and has passed this characteristic along to the new hybrid. Pan America appears suitable, the Bureau of Plant Industry reports, for canning, manufacturing of tomato products, or for marketing fresh.

▲ Vegetable-Oil Industry Aided Toward Stability

Brazil produces more than 20 varieties of vegetable oils, among them linaloe, copaiba, and andiroba. In order to place the industry on a more stable basis, the Ministry of Agriculture is providing technical and financial assistance.

A good example of what the government has done may be seen in the case of linaloe oil. This oil—also called *bois de rose*—is extracted from the wood of the linaloe tree. It is a colorless, thin liquid with a very penetrating aroma and is used extensively in the perfume industry. Brazil, although the only exporter of the oil, had not exported the product prior to 1930 to any great extent. During the period 1930–39, exports were increased about 350 percent.

▲ Valuable Insecticide From Tree Tobacco

The possibility that tree tobacco, now a worthless weed in the arid sections of Mexico and southwestern United States, may become a valuable cash crop is seen by United States scientists who have extracted from it anabasine, a valuable insecticide. The product was not discovered in the tree-tobacco plant until 1935, although it had been produced synthetically and found in an Asiatic plant 6 years earlier.

Tree tobacco is a native of Argentina and Uruguay. It grows on well-drained sandy waste land along or near irrigation canals and usually in colonies. Its scientific name is *Nicotiana glauca*, but it has a variety of local nicknames.

Extracted chemically from the so-called tree-tobacco plant, anabasine is a colorless liquid which turns brown after standing in contact with air. Chemically it greatly resembles nicotine and has similar properties.

A review of information on the subject was recently published by Dr. R. C. Roark, Division of Insecticide Investigations, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. Dr. Roark reports that anabasine is a potent insecticide, 4 or 5 times as effective against certain types of aphids as nicotine, which is commonly used today.

▲ Commerce of the Americas Studied by Foreign Traders

At the 1941 session in New York City of the National Foreign Trade Convention, annual get-together of those interested in the foreign commerce of the United States, major attention was given to inter-American relationships and trade.

In its final declaration, the convention said: "Inter-American collaboration in commercial, as well as in cultural and political matters, is, in spite of serious counter-currents, promoting solidarity of interest in the defense of the Western Hemisphere." The group endorsed completion of the Pan American Highway, formation of a permanent council of American Associations of Commerce and Production, and encouragement of inter-American education.

▲ New Type Faces Used in Revised Format

Beginning Volume II with this issue, "Agriculture in the Americas" assumes a new format, designed for easier reading and to permit inclusion of more material in each issue. Volume I was printed throughout in Bodoni type. The new style employs Baskerville type for the text, with Garamond Boldface for display lines.

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The new San Felipe dam in the Province of San Luis, Argentina, will provide irrigation for more than 30,000 acres of land.

AGRICULTURE IN THE AMERICAS ROBERT H. INGRAM, EDITOR

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Diogenes Escalante

OUR MUTUAL FRIEND

Through the forested lowlands of northwestern Venezuela and into oil-laden Lake Maracaibo flows the River Escalante, named for the Spanish explorer, Don Francisco de Escalante, who discovered it. That intrepid pioneer not only played an important role in the early history of Venezuela, but also founded one of the country's most distinguished families, which is ably represented in international councils today by Dr. Diogenes Escalante, Venezuelan Ambassador to the United States.

Born in Queniquea, Venezuela, Dr. Escalante studied at the Universities of Mérida and Caracas in his native land and later received a Doctor of Laws degree from the University of Geneva, Switzerland. Entering the diplomatic service in 1904 as Consul at Liverpool, he was soon promoted to Consul General in Germany and then to Secretary of Legation in Holland and France.

Home again after 6 years of service, he became absorbed in politics and journalism. In 1913 he was elected to Congress from the State of Sucre. The same year he founded a newspaper, "El Nuevo Diario," which quickly won rank among the leading dailies in Venezuela. Returning to the diplomatic service, he became active in the work of the League of Nations and was prevented from accepting a League assignment to aid in settling a boundary dispute among Albania, Greece, and Yugoslavia only by his appointment as Venezuelan Minister to London. While in the latter position he represented his country at the Geneva Disarmament Conference of 1932 and the London Economic Conference of 1933.

In 1936 he returned from London to the field of national government, serving Venezuela successively as Minister of Interior Relations and as Secretary to the President.

On October 6, 1938, Dr. Escalante delivered to President Roosevelt the letters which accredited him as Venezuela's Envoy Extraordinary and Minister Plenipotentiary to the United States. In 1939, the Legation was raised to the rank of Embassy, and on March 22 of that year Dr. Escalante became the first Ambassador of Venezuela to the United States. During his term of office in Washington he has served his country as chief delegate to the Inter-American Conferences of Lima and Havana.

Scholar, editor, and statesman, Dr. Escalante brings to Washington an understanding of his own country, the United States, and the world that is essential in these trying times.

How the American Republics Administer Agriculture

Agriculture stands high in the government councils of every American republic. Each of the 21 national cabinets includes a Secretary or Minister charged with responsibility for the welfare of the farm people of his nation.

In each of nine of the republics there is an executive branch with agriculture as its entire province. In the others, agricultural matters are administered along with related activities. In all of them, in addition, there are state, regional, provincial, or local agencies which supplement the work of the national services.

There are Ministries of Agriculture in the national governments of Argentina, Brazil, Cuba, Chile, and El Salvador, while Guatemala, like the United States, uses the form, Department of Agriculture. Uruguay has a Ministry of Livestock and Agriculture; and Venezuela, a Ministry of Agriculture and Animal Husbandry.

Several of the countries in which agricultural administration is combined with related functions, use the Spanish word *fomento* in the title of the appropriate agency. There is no exact translation of this word into English, but it has the same derivation as the English verb, foment, and is often rendered as "development." In Costa Rica and Mexico, then, are Departments of Agriculture and Development; and in Honduras, a Ministry of Development, Public Works and Agriculture. In Peru, agriculture falls within the domain of the executive arm called the Ministry of Development.

Bolivia includes the agricultural functions of its national government among those of the Minister of National Economy, and so does Colombia.

Titles of the principal national agricultural agencies in the other six republics show more variations. The Dominican Republic has its Department of Agriculture, Industry and Labor; Ecuador, a Ministry of Agriculture, Industry and Mines; Haiti, a Department of Public Instruction and Agriculture; Nicaragua, a Ministry of Agriculture and Labor; Panama, a Department of Agriculture and Commerce; and Paraguay, a Ministry of Agriculture, Commerce and Industry.

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IN THIS ISSUE

February 1942

Response to War

The response of Latin America to the Axis attack on the United States was perhaps the most heartening development in the history of inter-American relationships. One by one, the Latin American republics responded with actions indicating their unity in the defense of the Western Hemisphere. Some actually declared war on the Axis powers. Others froze Axis credits, broke diplomatic relationships with the aggressor nations, or granted the United States non-belligerent status. In a military sense, the effect of this solidarity is obvious. Economically, its consequences may be almost as far-reaching, both in the immediate future and over the long pull that lies ahead. One effect is certain to be increased emphasis on the program for cooperation in agriculture.

Given unusual importance by the extension of hostilities is the Inter-American Agricultural and Mineral Technical Advisory Service, a joint project of the Office of Inter-American Affairs, the Department of State, the Department of Interior, and the Department of Agriculture. Planned before the war broke out in the Pacific and put into effect almost immediately thereafter, it involves 70 technicians—30 of them specialists in agriculture and 40 in mining—who will be available to Latin American governments as advisers on commercial development of their resources. The first appointees have already left for Latin America; others will follow as they are selected.

In the emergency, the agricultural branch of the new Service will be immediately concerned with products which are on the strategical and critical material lists of the Army and Navy Munitions Board. On the list are such products as rubber, quinine, manila fiber, henequén, sisal, coconut shell char, wool and hides, tanning materials, kapok, palm oil, rotenone-bearing roots, and castor beans, most of which have already received attention under the inter-American agricultural cooperation program. How much emergency production is possible in Latin America and how it can be stimulated are questions the Technical Advisory Service is expected to help answer.

Veterinary Survey

To obtain first-hand information on the livestock and animal-disease situation in Latin America, *Dr. S. O. Fladness,* Chief of the Field Investigation Division, Bureau of Animal Industry, U. S. Department of Agriculture, is spending two months in Argentina and Chile. Previous residence in Argentina and broad knowledge of Latin American livestock problems make him well qualified for the survey, which is concerned primarily with the question of the existence of foot-and-mouth disease of livestock on the Island of Tierra del Fuego at the southern tip of South America.

Progress in Haiti

Financial success and enthusiastic public support have accompanied the early activities of SHADA, the Haitian-United States agricultural development corporation, reported T. A. Fennell, its president and general manager, on a recent visit to the United States. An account of SHADA's activities since its corporate existence began last August will appear in an early issue of *"Agriculture in the Americas."*

Agriculture IN THE *Americas*

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Central America in the Spotlight

Six republics, neighbors of the Panama Canal, stand as one in their resistance to aggression against the Western Hemisphere. Military allies of the United States, they also rank high among its natural partners in agricultural product trade.

by A. RANDLE ELLIOTT

North Americans have long since realized that Central America is something more than a land of revolutions and bananas. The current situation, however, has turned the spotlight on the six countries that lie between Mexico and South America and revealed their true stature in inter-American affairs. The prompt response of the Central American republics to the Axis attack on the United States was a striking example of Western Hemisphere unity. All six of them—Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama—were among the Latin American countries which sprang instantly to the side of the United States with declarations of war against Japan, Germany, and Italy.

Even before the conflict spread to the Americas, it had severed many cultural and economic ties between the new and old worlds and had stimulated the interest of the American nations in one another. The Central American republics, because of their strategic position and tropical economy, had been recognized not only as key links in the defense of the Panama Canal but also as potential sources of agricultural products urgently required in the United States. An example of the area's importance for military and economic defense of this Hemisphere has been the program to speed to early completion the Inter-American Highway between Mexico and the Panama Canal Zone.

There are, of course, six different countries in Central America—but economically they may be regarded as a unit, for the entire area is primarily agricultural. There are practically no heavy industries in any of the six republics, which are entirely dependent on imports for their requirements of iron and coal; and their small consumer industries are devoted almost exclusively to the processing of native foodstuffs or to the manufacture of commodities for local use from domestic agricultural products. The only minerals at present exploited in Central America are gold and silver, and small amounts of a few others such as chromium in Guatemala and manganese in Costa Rica.

Climate and topography have made possible a great variety of agricultural products in Central America. The region is entirely in the tropics, and its economy is built around a few tropical "money" crops—chiefly coffee and bananas—which are complementary to the agricultural output of the United States, and which are sold primarily to this country. Yet on the heavily forested slopes of the Central American mountain range many fields have been cleared and are given over to the production of staple foodstuffs, including such temperate-zone crops as corn, beans, and wheat.

Coffee is the leading export commodity of Central America, and ranks as the first commercial crop in each country except Panama and Honduras, where bananas lead. The six small republics contribute only 7 percent of the world's supply, but Central American coffee is

The Author

Mr. Elliott is a member of the staff of the Foreign Policy Association, a private organization which studies questions of United States foreign policy. This article is a condensation of "The Resources and Trade of Central America," written by Mr. Elliott and published by the Association in its series of *Foreign Policy Reports*.

important more for its quality than for its volume. Known for its flavor and mildness, it is widely used for blending with the stronger Brazilian grades. The coffee industry has expanded rapidly in the six republics, despite the serious economic dangers of too heavy reliance on a single export crop which is often subject to extreme price fluctuations on the world market. The key role of coffee in Central America may be appreciated from the fact that in normal times it provides El Salvador with approximately 90 percent of the value of its exports, Guatemala with 60 percent, Costa Rica with 50 percent, and Nicaragua with 35 percent.

Bananas Move Westward

Coffee contributes about half the total value of Central American exports, and bananas account for more than half of the remainder. Until several years ago, bananas regularly constituted about a third of total Central American exports, but the destructive Panama and sigatoka (or leaf-spot) diseases have made costly inroads on plantations all along the Caribbean seacoast. Now banana operations are being transferred to the Pacific side and this shift promises to contribute much to Central American prosperity, since Atlantic-coast soil that was rapidly being deprived of nutriment for banana plants can be utilized to produce hemisphere deficiency crops which will find a ready market in the United States. The five east coast countries of Central America, however, still turn out about 30 percent of all bananas entering international trade, and provide almost 60 percent of United States imports.

In trade value, cacao ranks after coffee and bananas among United States imports of complementary, or noncompetitive, edible agricultural products. This country absorbs almost 40 percent of the world supply, and normally obtains over half of its requirements from West Africa. No other raw material can be substituted for cacao in the manufacture of chocolate, cocoa, and cocoa butter. Costa Rica and Panama are the only significant Central American exporters of cacao, although Nicaragua and Guatemala each produces about a million pounds annually, and a small industry exists in Honduras and El Salvador. Since the Western Hemisphere at present does not produce enough cacao to satisfy its own needs, the Central American governments are encouraging production of the crop.

The value of other agricultural exports is relatively slight, but many of the commodities are significant because of their uses and the possibilities of their further exploitation in Central America. This is particularly true of the region's innumerable forest products, some of which cannot be obtained any other place in the world. El Salvador, for example, is the only known source for the misnamed balsam of Peru, used for antiseptic medicines and fine perfumes. Production has shrunk considerably in recent years, but along the "Balsam Coast" of western El Salvador there are still about 50,000 trees under exploitation, turning out from 300,000 to 500,000 pounds of crude balsam a year.

Chicle is another Central American "exotic" crop, obtained only from the wilds of northern Guatemala, British Honduras, and Mexico. It is used in the manufacture of surgical tapes and dental supplies, although by far its most important commercial use is as an adhesive base in chewing gum. In the period 1937–39 Guatemala sold an average of $524,869 worth of chicle to the United States per year, or almost 15 percent of this country's imports.

Sprawling forests of native hardwoods once provided the Central American countries with large portions of their revenues, and today they are still a latent source of considerable natural wealth. The new demand for tropical fancy hardwoods for interior decorations has recently interested United States capital in developing some of these areas, such as the heavily wooded hills of Veraguas and Chiriquí Provinces in Panama. Some of the world's finest stands of mahogany, cedar, rosewood, primavera (white mahogany), and other cabinet woods are to be found in the interiors of the Central American republics. Most of the accessible trees have been cleared, however, and the improvement of transportation systems in the region is a prerequisite to profitable logging in the rich forests away from the coasts. Valuable heavy woods like cocobolo and guayacán (lignum vitae)—used for knife handles, bearings, and propeller shafts—are exploited, but the present scale of operations is small.

Trees That Help in War

A recent Central American forestal trend is toward the cultivation of several trees with special properties useful for aviation and naval purposes. Balsa, twice as light as cork but strong, is largely employed for floats, refrigerator insulation, and airplane construction. It is already being exported in small quantities from Costa Rica, and because of the tree's extremely rapid growth its output can be increased substantially in only a few years. The ceiba tree is receiving wide attention in Central America as the source of kapok, or "tree cotton," for which a growing demand is anticipated in connection with the United States rearmament program. Kapok is used in making life preservers, sleeping bags, and insulation materials. During the years 1937–39 the United States imported an annual average of 9,114 tons of kapok valued at $2,474,000, less than 5 percent of which came from Latin America. At present, however, the commercial exploitation of kapok is being planned in several of the Central American republics, and one United States company already has between 200,000 and 300,000 ceiba

trees under constant supervision in Guatemala and El Salvador.

Natural dyes are obtained from a great number of Central American trees and plants. One of the most valuable coloring principles, haematoxylon, for black or blue dyeing of fine woolens, cottons, silks, and leather, is obtained from Central American logwood. Brazilwood—used also in cabinet making—produces red and purple dyes. Fustic is commonly applied in yellow artwork. Many local plant and animal dyes are widely used by Indians in their native handicrafts, and some of them—notably indigo (or anil) and cochineal—once enjoyed a lucrative export market.

Tannin From the Tropics

Tropical American tanning materials have become increasingly important for the United States leather industry, because of the rapid extinction of native chestnut trees by a highly contagious blight which struck this country shortly after the World War. Of 143 Latin American sources of vegetable tannin listed by the Department of Commerce, many grow wild in Central America. Mangrove extract, widely used for curing heavy leather in the United States, is customarily imported from Portuguese East Africa. Mangrove is one of the commonest tropical growths of Central America, however, and transatlantic shipping difficulties may now make the exploitation of these nearer sources more profitable.

The value of medicinal plants is not an impressive figure in Central American export tables, but some of our vital remedies depend on continued imports of such items as ipecac, a specific for treating amoebic dysentery, and copaiba, much used in affections of the mucous membranes. Ipecacuanha roots, the source of ipecac, are obtained from Nicaragua, Honduras, Costa Rica, and Panama, while the latter is also a source for copaiba. Sarsaparilla from Honduras has been known as a tonic for over 400 years, and the Costa Rican variety of the same plant is used for standard preparations in British pharmacology. Many other Central American plants, like cedron and copalche, are prized locally for their medicinal properties, and will bear further study by tropical agriculturalists.

Central America is of great importance in efforts to develop Western Hemisphere supplies of cinchona bark, the source of quinine, most effective medicine for treating malaria. In recent years, annual shipments of quinine to the United States have averaged 1,738,431 pounds, valued at $735,411, about 98 percent of which has come from the Netherlands Indies. Long before this area became involved directly in the war, the Department of Agriculture had aided in the establishment of several cinchona nurseries in Guatemala, where commercial plantings of the tree have already been made. While it is still too early to judge the real value of these efforts, considerable success has been indicated. Another noteworthy enterprise is under way in Honduras, where one company is growing 4,000 cinchona trees in the rich agricultural district of Olancho.

Two other Central American experimental crops deserve mention because of their present strategic value to the United States: rubber and abacá. The development of rubber plantations in Central America has heretofore been impeded by two problems which now show promise of solution—the prevalence of the destructive South American leaf blight, and the inability of the American product to compete commercially with rubber produced by low-paid labor in the Far East. Previous issues of this magazine have described the preliminary success of current rubber developments in the Caribbean area, and especially in Central America. The Goodyear Company has had encouraging results in Panama since 1935 and in Costa Rica since 1936. For over a year experts from the Bureau of Plant Industry of the Department of Agriculture, with a $500,000 fund appropriated by Congress in June 1940, have helped local governments speed up the rubber program in Equatorial America. They have been particularly impressed by the rubber potentialities of districts on the western coast of Guatemala and on the Caribbean coasts of Honduras and Costa Rica. A central experiment station for the entire project is being established near Turrialba, Costa Rica, and a central nursery is situated in Honduras. The first large order of seedlings arrived in Honduras in November 1940 and the young trees are now growing vigorously.

A New Home for Hemp

While abacá (manila hemp) has not been given such an auspicious start as rubber, about 2,200 acres of abandoned banana lands in western Panama have been turned over to experimental growings of this valuable hard fiber. Abacá is peculiarly resistant to salt water, and to date no substitute has been found to replace it for the many ropes and cables required by our navy and merchant marine. The chief handicap to production of abacá in the Western Hemisphere is apparently the high cost of cleaning the fiber—which is hand-cleaned by low-paid labor in the Philippines, the East Indies, and Africa. This obstacle, however, would be overcome with perfection of fiber-cleaning machinery.

Certain vegetable fats, oils, and waxes constitute an important group of potential Central American resources. Coconuts, a leading source of vegetable fat, have for years been imported from the Far East in great quantities by the United States. They are, however, a prominent staple of the San Blas Islands of Panama and the Bay Islands of Honduras, and are grown in smaller amounts

Courtesy Davis Press Inc.

Central American art and crafts are known in many parts of the world. Guatemalan pottery (above) is sold from open markets. The wood cut, "Panchimalco" (lower left) is by José Mejia Vides of El Salvador. At lower right is a view of Cathedral Plaza in Panama City.

American National Committee of Engraving

Courtesy Pan American Union

Courtesy Pan American Union

Agriculture is the principal occupation in Central America. Agua Caliente farm (upper left) is near Tegucigalpa, capital of Honduras. Costa Rica produces pineapples of fine quality (right). Guinea grass (below) is hauled by oxen on the farm of President Somoza of Nicaragua.

Photo by John Strohm, courtesy Prairie Farmer

in Nicaragua. Cohune nuts, product of a palm which is extremely plentiful throughout Central America, yield a kernel oil much like that of the coconut and similarly used for making fine soaps, butter substitutes, and pharmaceuticals. The cohune palm has been exploited on a small scale in all the Central American republics, and proposals for making it the basis of a profitable Central American industry are now widely discussed. The castor-oil plant—source of medicines, lubricants, and invaluable drying oils for paints and varnishes—also grows freely throughout the region. Guatemala, Costa Rica, and El Salvador have been increasing their exports of honey to the United States and now appear as prospective sources of beeswax, which is not produced in sufficient quantities in this country. Candelilla wax, obtained from a common shrub in the semiarid regions of Mexico and Central America, is used as a substitute for beeswax in making varnishes, phonograph records, and electrical insulation.

One of the most promising categories of Central American resources is that of tropical fruits. There is little reason why some of the myriad delicacies in this group should not be popularized in temperate zones just as bananas have been. United States quarantine laws bar imports of certain tropical fruits in order to prevent infiltration of insect enemies; but no canned juices and pulps are included in the regulations, and they might find an immediate market in this country.

The effective operation of the Central American economy—built primarily around a few tropical agricultural exports—depends largely on the availability of low-cost subsistence crops to support plantation workers. These crops consist chiefly of corn, beans, rice, and wheat. They are harvested from one to three times a year, depending on the altitude in which they are grown. While complete production statistics are not available for the leading staples, an indication of their importance to the Central American peoples may be seen in the fact that the total acreage under local food crops greatly exceeds the acreage producing bananas and coffee. Sugar is also raised for local consumption in each of the six republics, and small amounts are exported from El Salvador, Guatemala, Nicaragua, and Costa Rica.

A good share of local food needs, especially for the middle and upper classes of the population, is provided by the region's pastoral products. All of the Central American countries raise livestock for meat and cattle for dairying, and most of them enjoy a small export trade in live animals, hides, and skins. A large share of Panama's meat is consumed in the Canal Zone and constitutes an invaluable food supply for that strategic defense outpost. The expansion of livestock industries and the extended cultivation of fruits and vegetables in Panama and Costa Rica—and in all Central America after land transportation to the Canal Zone is improved—would solve an outstanding problem of provisioning the United States military and civilian forces at the Canal.

Fully allied in military affairs, the United States and the Central American republics are natural economic partners as well, since virtually none of their exports compete in world markets. This consideration was accentuated a few months ago when each of the six governments organized national councils of the Inter-American Development Commission, to encourage local industry and the production of consumer goods with United States aid. Central America needs this country's technical assistance and capital. The several republics would also benefit by relaxation of the tariff barriers and divergent laws that, since colonial days, have impeded their trade with one another. The construction of a commercial highway system extending throughout Central America will eventually do much to unify trade practices, as well as promote the exchange of products. This economic integration of the region would reinforce United States aid toward helping Central American countries in the development of their resources and, by raising the general standard of living, would strengthen the friendly countries of this vital strategic area.

Reading
ABOUT THE AMERICAS

Strategy of the Americas, Fleming MacLeish and Cushman Reynolds; 247 pp., Duell, Sloan & Pearce, New York, 1941. Deals with facts and problems of hemisphere defense—economic, military, naval, etc.

South America and Hemisphere Defense, J. Fred Rippy; 101 pp., Louisiana State University Press, Baton Rouge, 1941. A series of lectures dealing with some phases of the relations of the United States and South America.

Latin America, William Lytle Schurz; 378 pp., E. P. Dutton & Co., Inc., New York, 1941. A carefully written book by an author who has had 30 years of travel and experience in the field. Deals with the land, history, government, economy, international relations, cultural and social organization.

The United States and the Independence of Latin America, 1800–1830, Arthur Preston Whitaker; 632 pp., The Johns Hopkins Press, Baltimore, 1941. A study of inter-American affairs in the first 30 years of the nineteenth century, when the idea of hemispheric solidarity first took definite shape in the New World.

War Speeds the Rubber Project

With present sources of practically all rubber threatened by war in the Pacific, the Americas are fortunate that the program for Western Hemisphere rubber production, once dependent on the Far East for plant materials, now stands solidly on its own feet.

by LOREN G. POLHAMUS

As war clouds collided over the Pacific, with reverbations that thundered around the world, a final shipment of budded rubber trees from the Philippines was rushed across the troubled waters to rubber's native home in the American tropics. With that shipment of planting material came the assurance that, despite the war, the program to establish plantation rubber production in the Western Hemisphere would not be interrupted.

The outbreak of war involving the United States has, in fact, emphasized the importance of growing rubber on a commercial scale in the Americas. This country, the world's greatest consumer of rubber, has been importing practically all of its supplies, normally about 600,000 tons a year, from British Malaya and the Netherlands East Indies, two of the most immediate Japanese objectives. While a system of convoys from the beleaguered areas presumably will be established, it must be assumed that United States imports of crude rubber will be, at the best, sharply curtailed for the duration of the war. Both in meeting this emergency and in preventing its recurrence, the Latin American rubber development project is of cardinal importance.

The rubber project is well conditioned for war-time functioning, for there has been war in the world ever since the project began 2 years ago. Five shipments of planting material have been brought from the Far East and Africa. Each has encountered the trials of dangerous seas and war-disrupted shipping schedules, and bad weather has added extra hazards. Despite all these disadvantages, however, 15,000,000 rubber trees have been planted in Latin America since the program started, 10,000,000 of them under cooperative arrangements between the United States Department of Agriculture and 12 Latin American governments and the other 5,000,000 by United States commercial interests.

Far Eastern planting materials have been essential in bringing the Western Hemisphere project to its present stage of progress. The common rubber tree, *Hevea brasiliensis*, is an American native, and there are extensive stands of wild trees in Central and South America, from which it is expected that new strains of superior quality will be produced. On the other hand, it is in the East, where the most extensive research has been done, that the largest number of proven strains of high-yielding rubber trees has been developed. Early in the project it was realized that these fine strains already proved would form, if they could be obtained, a nucleus for immediate planting and would serve as breeding material for crossing with the improved types to be discovered in the American jungles. That is why shipments of delicate rubber plant materials across thousands of miles of hazardous ocean have been necessary.

Among the rubber plant materials introduced to the Western Hemisphere have been thousands of seeds, which are of good ancestry but have not themselves been proved for disease resistance and high-yielding qualities. Packed in charcoal, the seeds ship satisfactorily and ordinarily germinate well, even months after they have been gathered. Seeds sometimes produce outstanding individual trees—the Horatio Algers of the rubber world. These are the exceptional cases, however, since rubber trees developed from seeds may or may not have the desirable characteristics of their parents. Seeds are of considerably greater importance for growing stumps to which buds of time-tested trees can be grafted.

In the Western Hemisphere project, buds have been introduced from the Far East in two different forms—

The Author

Mr. Polhamus, who since 1923 has been active in Department of Agriculture experimental work dealing with rubber production, is now senior agronomist in the Office of Rubber Plant Investigations in the program to establish plantation rubber in the Western Hemisphere. He spent part of last year in Brazil, supervising the inauguration of the rubber program in that country, and has traveled extensively in the West Indies and Central America.

All photos by Bureau of Plant Industry

Many of the budded rubber stumps planted in the Western Hemisphere came from the plant nursery of the Pathfinder Estate on the Philippine island of Mindanao. Above, stumps are shown being gathered and inspected.

as budwood, which consists of three-foot lengths of parent tree branches each containing from 10 to 30 buds, and as budded stumps, the name given to seedling trees to which living buds have been transferred by grafting. The stumps are preferred to budwood, since they are ready for immediate planting. Both forms of material are extremely delicate and require great care in transit.

The first shipment of planting material from the East originated in the Philippines, as did the last. This first shipment, ordered soon after the initiation of the program, included budded trees of six strains. Among the vicissitudes of this pioneering cargo was a change in its itinerary made necessary when its ship was requisitioned by the Navy. Through use of radio, telegraph, telephone, and air mail, however, it was guided from Mindanao to Manila, thence to San Francisco, and on to Los Angeles, where it was unloaded from the boat and shipped by train to New Orleans, encountering the further hazard of an unseasonable frost along the way. Finally the 26 boxes of budded stumps left New Orleans on December 4, 1940. They arrived in Tela, Honduras, 4 days later and were immediately planted at the Lancetilla Experiment Station, the cooperative propagation center which had been established some months earlier.

The second shipment, also of budded stumps, was much larger, consisting of 106 cases and of about 80 strains. Because of the importance of the shipment, Prof. H. H. Bartlett of the University of Michigan was engaged to select the best strains, supervise the budding, labeling, and packing, and escort the trees on the long journey from the Philippines to Haiti. The precious cargo left Mindanao on January 25, 1941, and in due course reached the Canal Zone after having been unloaded for transshipment in both Manila and San Francisco. After some delay on wharves congested with freight for enlargement of the Canal facilities, the shipment was reloaded, set sail from the Canal Zone, and reached Haiti 73 days out of Mindanao.

The third Philippine consignment consisted of 58 boxes, containing 5,500 plants of 11 different clones (plant families), none of which had been included in previous shipments. It was this cargo that arrived in the United States only a few days before the Japanese attack on the Philippines. Because of the gathering war clouds and the rapidly expanding planting needs in Latin America, all arrangements for this final shipment were made by cable, a procedure which proved fortunate under the circumstances. The plants were divided among Haiti, Honduras, and Mexico.

Another important source of both seeds and budwood has been Liberia on the west coast of Africa. The material consisted primarily of crosses of known high-yielding clones which already had been shown to produce a high percentage of disease-resistant seedlings. The

first shipment, consisting of nine cases of seeds and budwood from 14 strains, left Africa August 23, 1941, arrived in New York City on September 12, 1941, and was transshipped to Belém, Brazil, for planting at the Instituto Agronómico do Norte, which is the rubber project headquarters in Brazil. The second Liberian cargo, largest of those transported from foreign lands under the Western Hemisphere project, consisted of 6,000,000 seeds. This material, packed in more than 700 cases, arrived in New York City October 15, 1941, and was divided for transshipment to Belém, Brazil, and to the U. S. D. A. Cooperative Rubber Plant Field Station at Turrialba, Costa Rica.

Not all the planting material used has come from abroad. Large amounts of budwood and seeds were collected by members of rubber survey parties, who visited all the cooperating countries at the beginning of the program. From Peru came two shipments of budwood and seed, and from Brazil, three shipments of seed. These were shipped to the cooperative planting stations in Costa Rica, Honduras, and Panama for testing and selection of new strains resistant to the South American leaf blight. For shipping budwood, air express was used, while shipments of seed went both by air and by sea. So important was the distribution of this material that the United States Army cooperated by furnishing two flights of bombers to transport seed from Brazil to Central America.

In February of 1941, the first bomber flight made a round trip, carrying 200 budded trees from Costa Rica to Brazil for testing and taking some 300,000 seeds back to Costa Rica. A month or so later, another flight of bombers left the Canal Zone with 500 budded rubber trees and 260 cuttings of abacá, a fiber plant being tested for interplanting with rubber. On the return trip, about 1,000,000 seeds were taken to Costa Rica.

The greatest importance of gathering together this wide variety of improved strains is that it enables the Western Hemisphere project to stand solidly on its own feet in rubber experimentation. At the Honduras and Haiti stations, the imported planting material is being propagated for further distribution in tropical America. Distribution of budded stumps and budwood already has started from the Lancetilla station in Honduras, which has furnished material to local growers in that country and has made shipments to experiment station centers in Colombia, Ecuador, Guatemala, Mexico, Peru, and Venezuela. These latter stations, in turn, will produce plant materials for still wider circulation.

So it goes in an ever-widening all-American circle of rubber production. Thanks to these shipments from the Far East, which managed to survive some of the most perilous sea-going imaginable, the Western Hemisphere has its own program of planting, budding, reshipment, and replanting that is now self-sustaining and completely free of reliance on distant lands.

Newly dug stumps (left) are wrapped in burlap for protection. Packed in wooden cases, they are drawn by oxen to the plantation boat landing for shipment to Manila, en route to the Western Hemisphere.

The Story of Vanilla

This native American food product drifted from its homeland centuries ago and, because of the discovery of a slave in a French colony, gained its greatest commercial importance in the eastern tropics. Today, production may be headed westward again.

by LOUIS C. NOLAN

Back of the flavor in vanilla custard or ice cream, there is a story—not very well known—of a rich native American heritage that has been neglected for centuries and is just coming to be appreciated.

Vanilla was one of the first gifts of the New World to the Old. Introduced from America to Europe, it was later transplanted to the eastern tropics, and commercial production became centered in the French Island of Madagascar. The Western Hemisphere now produces not more than a third of the world vanilla supply, but there have been recent definite signs of expansion of the industry in Mexico, an expansion which has been spurred by the war.

Among the ancient Aztecs, vanilla was so highly prized that it was one of the tributes which subject tribes laid at the feet of the Emperor. When the Spaniards under Hernando Cortéz overran Mexico in the sixteenth century, they found the natives using the fragrant substance to perfume and flavor their chocolate. The Spaniards, who liked the delicious flavor and realized its commercial possibilities, lost little time in introducing it to Europe, where demand for it grew by leaps and bounds.

As a result of this demand, Mexico increased its production somewhat by dividing the plants and setting them out anew under wild conditions, but it was under European auspices that true cultivation of the vanilla plant began to flourish. By the beginning of the nineteenth century, it was being grown in various botanical museums and gardens in Paris. The fledgling industry was on its way toward even more distant lands where it was to reach full maturity.

The chief barrier to expansion of production in the early days was that no satisfactory method of pollination had been found. The vanilla plant is an orchid—the only orchid of economic importance other than those grown for the beauty of their flowers. While the plant contains both male and female parts, they are separated by a membranous partition which makes self-fertilization impossible.

In early Mexican production a capricious sort of pollination was done by the wind and by native insects. In other areas there were no insects with a taste for vanilla, and establishment of commercial production took some ingenuity. Not until European botanists in the first half of the nineteenth century hit upon a plan for fertilizing the flowers artificially was large-scale production possible anywhere. One of the first methods of fertilization probably was that of removing the membrane that sepaates the anther and pistil. The method used today, manually implanting the pollen in the pistil, was devised by a Negro slave named Edmond Albius, who lived on the Island of Réunion near Madagascar.

With this development, commercial production got under way in the French possessions. As late as the middle of the nineteenth century, the State of Veracruz, Mexico, was about the only source of commercial vanilla in the world, but by 1886 this area had been surpassed by the newer producing regions in Asia and Africa. The Mexicans did not adopt the method of artificial fertilization until 1890 or later, and by then the eastern world had a strong hold on world markets.

Today, the Western Hemisphere—chiefly Mexico, Guadaloupe in the French West Indies, and Puerto

The Author

Dr. Nolan is a member of the staff of the Office of Foreign Agricultural Relations. His previous contributions to *Agriculture in the Americas* have been "Birthday of a Bonanza" (November 1941) and "A New Link With Argentina" (December 1941). A detailed study of Mexican vanilla production, written by L. D. Mallory, United States agricultural attaché in Mexico City, and William P. Cochran, Jr., American consul in Veracruz, appeared in the November 1941 issue of *Foreign Agriculture*.

These are vanilla beans laid out in a dry yard in Mexico. After exposure to the sun, the beans will be placed in a "sweat-box" for further curing to bring out the vanilla flavor.

Rico—accounts for no more than a third of the world's commercial vanilla production. The rest, at least two-thirds of the total, comes from the far-away French possessions of Madagascar, the Comoro Islands, French Oceania, Réunion, and Tahiti, from the Netherlands Indies, and from the Seychelles Islands, a British possession off the east African coast. Mexico is the second largest producer but its output is only a third as great as that of Madagascar.

The most important of the 51 known species of vanilla is *Vanilla planifolia*, a native of Mexico which is also found occasionally in Florida. Its chief requirement is a hot, damp climate. *Vanilla pompana* is distributed much more widely than *planifolia*, ranging from Mexico south to the northern countries of South America, but its "beans" are less highly regarded commercially. Fifteen different species of vanilla grow wild in Brazil and Guiana, and three in Peru and Ecuador.

In its native environment the vanilla plant attaches itself to trees, shrubs, and rocks. It thrives best in the shade of a tropical forest. Technically, it is an air plant and, like all green plants, it makes it own food. It is a strong climber, with long, flexuous green stems and acute, oblong leaves. Nearly opposite the leaves, the stem sends out a white aerial root by means of which it grasps the nearest available tree or shrub for support.

In the species *planifolia*, the flowers are yellow with pale green sepals and not unlike the tuberose. From the flowers there burst forth pods somewhat resembling string beans but longer and broader. These podlike fruits, the so-called vanilla beans, grow rapidly and soon reach a length varying from 6 to 9 or 10 inches. They are the source of the vanilla flavor.

After being harvested, the pods are subjected to a lengthy drying process that reduces their weight from 50 or 60 pounds per thousand to 12 pounds or less. The cured "beans" contain roughly an eighth or more of their weight in extractable oleoresins and other aromatic constitutents, of which vanillin, a volatile oil, is the most important. It is vanillin, developed through curing and fermentation, that gives vanilla much of its characteristic aroma and taste. The cured beans are customarily exported, and the oils are extracted in the consuming country.

Some vanilla beans are used in the manufacture of perfumes and liqueurs, but most of them are utilized in the form of an alcoholic extract as the familiar flavoring of foods, confectionery, and beverages.

Since the tropical vanilla plant does not grow in the United States, this country is entirely dependent on im-

ports for true vanilla extract. There is, however, considerable production of synthetic vanillin, for which the raw material may be eugenol found in imported oil of cloves or either of two domestic products—guaiacol, a coal-tar product, or lignin, a byproduct of the wood pulp industry. Synthetic vanillin, usually flavored with tonka bean extract or a similar material, may be used as a substitute for natural vanilla extract, or the natural and synthetic products may be mixed in varying degrees according to manufacturers' formulas. During the 1920's, United States consumption of synthetic vanilla extract averaged about four times that of natural vanilla on the basis of equal flavoring capacities. In more recent years, the proportion of natural vanilla consumed has been even less.

The principal reason for the ascendancy of the synthetic product is that under normal conditions it is considerably cheaper than natural vanilla extract. The synthetic product has the further advantage of coming from domestic products, supplies of which are normally ample, and it doubtless could be substituted entirely for natural vanilla if no beans could be imported. Even so, many people will continue to prefer the characteristic flavor of the vanilla bean in spite of the difference in price. Hence, a substantial market for a good quality natural vanilla will continue to exist in the United States.

In recent years, the United States has been importing about 1,000,000 pounds of vanilla beans a year, valued at about $2,500,000. About a quarter of these came from Mexico and the French West Indies. Most of the remainder originated in Madagascar and Tahiti. Transportation problems growing out of war brought a change in this situation, however, and the United States has been forced to rely more completely upon supplies from the Western Hemisphere. During the first 8 months of 1941 the Western Hemisphere (Mexico, the French West Indies, and Brazil) supplied three-fifths of the vanilla imported into the United States. Direct participation of the United States in the war means even greater pressure on shipping, and makes the expansion of Western Hemisphere sources extremely desirable.

There is little question that our best hope for expanded inter-American trade and hemispheric self-sufficiency in vanilla lies in the direction of Mexico, which is by far the largest Latin American exporter and has already given considerable attention to a program for supplying more of the United States market. Considered within well-defined limits and from a relatively short-time point of view, the possibilities for expanded Mexican vanilla production are not discouraging.

Prices to growers are a basic factor influencing Mexico's output of green vanilla beans. While production does not respond immediately to price fluctuations, because of the perennial nature of the plant's productive life, price trends do reflect themselves in production trends within a few years. One result of the curtailment of eastern supplies has been to boost the New York price of Mexican beans in recent weeks to the unusually high figure of $13 to $15 per pound, compared to $5 or $5.50 during the first half of 1939. That price level, if maintained, is almost certain to stimulate Mexican production.

From a short-time point of view, this increased production probably will be promoted further by a decree which President Avila Camacho of Mexico issued last July. This decree prohibits the cutting and curing of the vanilla crop before a certain date and limits the time during which beans may be exported to the period from January 15 to July 15 of each year. Time of harvesting has an important bearing on the quality and yield of cured vanilla obtained from the green beans. The sharp rise in prices in recent years has put a premium upon Mexican beans, inducing producers to harvest their beans prematurely for fear of having them stolen off the vines, and inducing curers to buy and cure the beans early. Although the problem is not altogether new, the result in 1940 was that harvesting began in August when it should not have been started before October or November. This premature harvesting resulted in a crop of cured vanilla one-fifth smaller than it otherwise would have been.

In the present Mexican producing area (the States of Veracruz, Puebla, Tabasco, Chiapas, Oaxaca, and San Luis Potosí) there are sufficient lands and producers to take care of a greatly increased production—possibly in excess of 2,000,000 pounds. A number of other areas in Mexico also appear suitable for growing vanilla. The fact is, however, that production is an art as well as a science of culture which cannot be taught easily. The truth of this is borne out by the fact that production in Mexico has been confined almost entirely to the lands of the Totonaco Indians, who alone seem to have the combination of skill, industry, and foresight essential to vanilla culture. Many years, doubtless, would be required before additional growers could become proficient in their production efforts. Another big obstacle is the lack of skilled workmen for curing the beans—a highly technical job—and it is altogether possible that any attempts to train new curers might meet with pronounced opposition from organized labor groups.

All in all, any hope for Mexico's becoming the chief long-time source of vanilla supply for the United States must be based largely on the possibilities for improving the strains and yields of plants, the curing process, and the transportation facilities, thereby lowering marketing costs. These and other possibilities should be pursued with all possible speed in order that the Western Hemisphere may be made self-sufficient in its vanilla production.

Electricity in Argentina

by FRANCISCO VILLAR MATTHIS*

Argentina is a rural country with an urban population. That is why, in talking about electrification, rural problems and urban problems have to be considered together. You see, although Argentina is essentially a grain-raising country, three-fourths of the people live in cities or towns of more than 2,000 population. That is because of the country's system of large-scale cultivation, in which small farms (the type the United States calls "family size" farms) are practically unknown.

These large farms are from 1,000 to 10,000 acres in size and are machine-cultivated. The farmer generally does not own the land but cultivates it as a tenant for a period of several years, paying his rent with part of the crop or in cash.

This is not necessarily a permanent condition, however. Argentina's progressive farm people are being given greater opportunities than ever before to attain ownership of the fertile acres which they till. As this condition advances, the demand for electrification of farms is going to increase steadily. That is why my country, already extremely active in the electrification field, is much interested in the program of the Rural Electrification Administration of the United States Department of Agriculture and welcomes the opportunity to find out more about it.

Each of Argentina's geographical areas imposes different problems on the student of the use of electric power. The principal region, the rich and fertile "Pampas," constitutes the great plains of the eastern and central sections of the country. Here the great part of the population, production, and wealth of the nation is found, and here the greatest advances in electrification, both rural and urban, have been made.

In the irrigated sections, particularly those in central

*THE AUTHOR, whose home is in Argentina, appears second from the left in the above photograph of eight engineers from Latin America, who are now in the United States for a year's study in the training program of the Rural Electrification Administration, U. S. Department of Agriculture. The men, ranging in age from 23 to 30, are graduates of high-ranking engineering schools in their own countries. In the picture, left to right, are: Benjamín Hernández, Honduras; Francisco Villar Matthis, Argentina; Manuel López-Jiménez, Peru; Luis Adolfo Cagno Rossi, Uruguay; Antonio Elizondo, Mexico; Juan L. Lizzaralde, Guatemala; Hernando Martínez Cárdenas, Colombia; and Ernesto Ayala Oliva, Chile.

Argentina and along the western boundary, the population is dense and the majority of the farms are owned by those who cultivate them. This area has considerable possibilities for an expanded program of rural electrification, utilizing the numerous rivers which flow from the snow-covered Andes and are now used principally to supply irrigation water.

The rest of Argentina is made up largely of semiarid regions that lack means of irrigation. In these, the rural population is scattered and livestock raising and wood cutting are the chief occupations. In general, people are poor and the problem of making electricity available is coupled with that of raising the purchasing power of the inhabitants.

There is a distinct war note in Argentina's electric power situation, since much of the electricity is produced with coal imported from Europe. Argentina has no coal deposits of its own. There is some oil production in Patagonia, Argentina's southern region, and there are also large imports from Venezuela and Peru. For this reason, the largest power plants are situated in the chief seaports, Buenos Aires and Rosario, in the Pampas area. These are also the chief consuming centers.

In the rest of the country, electricity is produced with Diesel plants of various sizes. There is also some production from hydroelectric plants, although this is of minor importance compared with amounts produced by other means. There are four major hydroelectric plants, one of which belongs to the national government. There are also a few small state-owned plants of this type, most of them situated in small villages in the mountainous regions.

Most of the power industry in Argentina is managed by a few large private concerns, which generally are parts of still larger international companies. These enterprises are operated under concessions for periods determined by the government. At the expiration of a concession, the grant reverts to the government, which has the power to operate the plant or to renew the grant under new conditions.

In the average cities of from 20,000 to 50,000 people, electric power consumers have developed a good many cooperatives as a means of obtaining lower rates. These cooperatives, authorized and regulated by law, are ordinarily organized by a number of the principal consumers, each of whom agrees to buy shares. With the capital thus obtained, the plant and the distribution lines are built. While only the larger consumers own stock, anyone who will pay for service may obtain it.

In the smaller towns and villages, where there are not enough consumers to operate a power plant profitably, electric service usually is furnished by a small privately owned plant, operated by a businessman who resides in the community. While the small capacity makes this type of electric service expensive, the system does enable practically every village of more than 200 or 300 inhabitants to enjoy the benefits of electric power.

The isolated homes are not so fortunate. Occupants of the ordinary farm or ranch have to depend on a small home plant, operated by gasoline or by a windmill, which supplies domestic needs, such as lighting, radio, water pumps, and small machinery. Rural people who cannot afford this type of equipment simply do without the comforts of electricity.

For many years and until quite recently, the production and distribution of electric power has been regarded in Argentina as a public service which should be carried on by private enterprise. There are several evidences, however, of a change in this traditional belief, which has already been altered in the case of transportation and some other public services.

With a view to improving the economic condition of the people who reside in the mountain regions of the middle north and west of the republic, the national government, through the Dirección General de Irrigación has built and continues to build, jointly with irrigation works, small hydroelectric plants, from which power is sold at cost.

Power plants are also being built in connection with construction of the country's large dams. Already a 12,000-horsepower plant is in operation on the dam on the Rio III in the State of Córdoba. Another plant, this one of 10,000 horsepower, is under construction on the same reservoir. The power produced by these dams is to be supplied to the small cooperatives in the neighboring towns, thus both improving the quality of the service available in these rural areas and lowering the cost to the consumer.

Included in the program for the building of hydraulic works in the immediate future are plans for the construction of a dam and power plant of approximately 200,000 horsepower in the State of Mendoza, about 700 miles from Buenos Aires. Plans are now under study for the construction of a transmission line from the plant to Buenos Aires, a line which would make electric power available throughout the intervening territory.

Argentina's program today is to extend the benefits of electricity and modern electrical appliances to the maximum number of homes and at more equitable rates than have existed. The development of a system of rural electrification in Argentina similar to the REA in the United States fits logically into this expanding plan.

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Venezuelan highways, practically nonexistent before 1908, are now the principal means of inland communication.

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Henry Clay was an early champion of the recognition of independence of the Latin American Republics after they revolted against Spain.

ALONG THE

Agricultural Front

▲ New Trade Agreement With Cuba Signed

Trade ties between Cuba and the United States have been further strengthened by a supplementary trade agreement signed December 23 in Havana. Signers were George S. Messersmith, United States Ambassador to Cuba, and Dr. José Manuel Cortina, Cuban Minister of State.

The new agreement supplements and amends the trade agreement of August 24, 1934, between the two countries, which was first amended by the supplementary agreement of December 18, 1939. It takes into account developments that have occurred since the signing of these earlier agreements and provides for additional reductions by each country in the tariff rates on specified imports from the other, as well as other mutually advantageous changes.

Under the new agreement Cuba grants additional reductions in duty on certain agricultural products imported from the United States, including many kinds of fresh, dried, and preserved fruits; fruit juices; certain fresh and canned vegetables; certain canned soups and sauces; corn starch used for food; glucose and alfalfa meal. Cuba also agrees not to increase the duty on canned tomato soup from the United States and on certain other starches used for food. Of benefit to United States soybean producers is the Cuban agreement to reduce from 1 percent to one-half of 1 percent the minimum acid-content required in soybean oil imported from the United States.

In addition to these provisions affecting agricultural products, Cuba grants reduced tariff rates on such manufactured articles from the United States as automobile and truck parts and accessories, chewing gum, and metal office furniture.

In return, the United States grants concessions on the following agricultural products imported from Cuba: Sugar, molasses, and sirups; cigar tobacco and cigars; certain tropical

To create greater public interest in coffee, the Pan American Coffee Bureau recently invited girls from seven coffee-producing countries of Latin America to visit the United States. Among the many events arranged for the "queens" was a Coffee Party at the White House in Washington, where this picture was taken. Left to right are: María Cándida de Souza Dantas, Brazil; Mercedes Lucy Sáenz Dávila, Colombia; Florencia Sanz Pérez Cisneros, Cuba; Mrs. Franklin D. Roosevelt, who was hostess to the visitors; Leda Fernández, Costa Rica; Elena Quiñónez, El Salvador; and Nati Mata, Venezuela. Absent from the picture is Beatrice Salcedo Ochoa, who was Mexico's representative.

fruits and fruit pastes and pulps; fresh, chilled or frozen beef; and frog legs. The duty on raw sugar imported from Cuba is reduced from 90 cents to 75 cents per 100 pounds but takes into account the extension of sugar quota legislation under which the quantities imported from Cuba would continue to be subject to quotas.

The duty on Cuban cigar tobacco is reduced but the maximum quantity of cigar filler and scrap tobacco to which the reduction is applicable remains, as before, at 22 million pounds unstemmed leaf equivalent. The duty on beef and veal (fresh, chilled, or frozen) from Cuba is reduced from 4.8 cents to 3 cents per pound.

▲ Tells Farm Groups of Latin American Trip

Back from six months in Latin America, Karl Olsen of the Office of Inter-American Affairs is now speaking at farm meetings throughout the United States, describing the political, agricultural, and industrial activities he observed. Olsen, a native North Dakotan, is already well known to farmers in the Middle West and West, having spoken on European affairs throughout that area after his return from Cambridge University in England at the outbreak of the war in Europe in 1939.

▲ Returns From Study of Latin American Fibers

John Z. Williams, former United States Vice Consul in the Dominican Republic, has returned from a trip in which he studied the fiber situation in Latin America, both as to immediate aspects of the situation and as to possible future developments.

Williams visited Colombia, Mexico, and all the Central American countries. In addition, he has obtained reports on the fiber situation in all other Latin American countries from United States diplomatic and consular representatives. From information obtained, he will develop a plan for the wider utilization of native fiber crops of Latin America in place of imported products and for the development of new uses for fiber plants.

▲ Inter-American Seminar Held in New York City

Under the auspices of the Foundation for the Advancement of Social Sciences of the University of Denver, Colorado, the first Inter-American Seminar on Social Problems was held in December at the New School for Social Research in New York City.

Ten selected Latin American educators and writers took part in the Seminar, along with a number of leading writers and educators from the United States, among whom were Prof. John Dewey and John Dos Passos. Topics discussed were: "Man and the Land," "Economic Equilibrium of the American Republics," "Education as a Factor in Social and Cultural Progress," and "Democratic Defense." At the closing session, Vice President Henry A. Wallace discussed common problems of the Americas with delegates in Spanish.

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Venezuela supplies 25 percent of all oil produced outside the United States and accounts for 70 percent of all oil from South America.

▲ Export Difficulties for Argentine Fruit Growers

Shipping difficulties growing out of the war have created a serious problem for Argentine growers of fresh fruits. At a recent meeting in Mendoza of the Association of Export Grape Growers, it was reported that the number of vessels available for transporting their crops to the United States in the 1942 season would be sharply curtailed from the 1941 level.

Grapes and pears are not entitled to preferential shipping treatment, it was reported, while the 16 former Italian vessels being put to sea under the Argentine flag are not to be equipped as fruit carriers. State-aided fruit drying and preserving were suggested as remedies for the grave situation.

▲ Colombia Proposes Site for Tropical Institute

A site for the proposed inter-American Tropical Institute has been offered by the government of Colombia, bringing to six the number of definite locations offered by Latin American republics. Establishment of the Institute in Colombia has been endorsed by formal resolution of the Sociedad de Agricultores (Farmers' Society) of Colombia.

The site, situated in the Cauca Valley not far from the city of Cali, is to be inspected in the near future by a United States Department of Agriculture party. Sites in Brazil, Costa Rica, Ecuador, El Salvador, and Venezuela have already been inspected by a survey group from the United States.

AGRICULTURE IN THE AMERICAS ROBERT H. INGRAM, EDITOR

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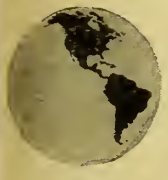
Luis Fernández

OUR MUTUAL FRIEND



Almost before the echo of the bombs had died over Pearl Harbor, the Central American Republic of Costa Rica was at war with Japan. This was before even the United States and Great Britain had formally declared war. Within four days, Costa Rica had added Germany and Italy to the list of countries with which it was on belligerent terms.

This was the response to an attack on the Americas from one of the smallest but one of the most strategically situated of all the American Republics. The promptness of the action is typical of the firm bond that has grown up between Costa Rica and the United States during the term of Dr. Luis Fernández as Costa Rica's Minister to Washington. Into his capable hands now fall the duties that that close relationship will make necessary in coming months.

Born in the city of Alajuela, Dr. Fernández was graduated as an attorney from the University of San José in the national capital. Two years later he entered upon a judicial career and within nine years after his University graduation had become a judge of the Supreme Court of Justice of Costa Rica, a position in which he served with distinction for 14 years.

In May, 1936, he entered the executive branch of the National Government with his appointment as Secretary of State for the Offices of Government, Police, Labor and Social Welfare. He also served provisional appointments in the Departments of Treasury and Commerce and of Foreign Relations. In the latter position, he helped to arrange and signed the trade agreement between Costa Rica and the United States, which greatly strengthened the ties of both friendship and commerce between the two countries.

The seasoned jurist and public servant gained his first experience in the diplomatic field in 1937, when he headed a special Costa Rican Mission to the Government of Great Britain. In May, 1940, when Dr. Rafael Angel Calderón Guardia became President of Costa Rica, Dr. Fernández was appointed Minister to the States.

In two years in Washington, two years that have seen unprecedented activity in inter-American relationships, Costa Rica's minister has acquitted himself ably and has demonstrated his ability to cope with the complications that the war brings to all countries.

National Flowers of the American Republics

In the Garden of Peace in La Plata, Argentina, national flowers are on display from 18 of the 21 American Republics. Not all the countries have officially designated national flowers, and in those cases scientific organizations selected the flowers to be sent to the Garden.

Several flowers were chosen by more than one country. The *ceibo* is the choice of Argentina and Uruguay. This plant is also known as the coral tree, the cock's comb or the coxcomb evergreen. The Cattleya orchid, a rarity in temperate climes, is the national flower of both Colombia and Costa Rica. Bolivia and Peru designate the *cantúa*, a shrub with red and yellow blossoms closely associated with early Indian tradition. The selection of both Cuba and Nicaragua is the *caña de ámbar.* Cuba also has a national tree—the royal palm, which appears on its coat of arms.

Brazil is represented by the *ipé*, a tree with golden yellow bells; and Chile selects the *copihue*, the red flowers of which are said to represent the blood shed by Araucanian Indians in their struggle for liberty. Guatemala chooses a type of white orchid known in that country as the White Sister. Panama has two choices—the Panama tree and a species of orchid known as the Holy Ghost or dove flower. Paraguay designates the *Jazmín del Paraguay,* a flowering shrub.

Other designations are plants familiar throughout the Americas—the mahogany tree for the Dominican Republic; the quinine tree for Ecuador; the coffee tree for El Salvador; the dahlia for Mexico; and the wild rose for the United States.

These are the American flowers growing in the Garden of Peace, but not all authorities agree with all of them as representing the national flowers of their respective countries. From other sources come reports that the national flower of Mexico is the nopal or prickly pear cactus; that Peru's is the sunflower; and that the Unite States choice is the goldenrod.

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IN THIS ISSUE

March 1942

NAMES & NEWS

Wild Rubber

Latin America is a fertile prospective source of plantation rubber, on which the United States may rely in years to come. More than that, it has a present small production of crude rubber from wild trees, and in its jungles are literally millions of untapped trees, capable of supplying no inconsiderable part of the rubber needed to tide the United States through the first raw material crisis of World War II.

To find these trees and devise methods for drawing on their liquid riches, a group of trained rubber technicians is being sent to Latin America under the Inter-American Agricultural and Mineral Technical Advisory Service announced a month ago.

Heading the project is *C. B. Manifold,* on detail to the Office of Inter-American Affairs from the Soil Conservation Service, with which Department of Agriculture agency he is assistant chief in charge of technical operations. A veteran in the rubber field, Mr. Manifold was a member of the Department of Commerce survey party which in 1924 pioneered the effort to establish plantation rubber in Latin America. Later he was employed in rubber plantation operation in Liberia and the East Indies and in 1940 visited Central America and Brazil with a Department of Agriculture rubber survey group.

The emergency program will be coordinated closely with the long-term project for Western Hemisphere rubber production, with the "wild rubber" prospectors using the reports of the 1940 survey parties and cooperating with the research stations established by them.

Final Institute Surveys

Final inspections of proposed sites for the Inter-American Tropical Institute are now in progress. *George R. Boyd* of the Bureau of Agricultural Chemistry and Engineering left Washington early in February to survey sites offered by the governments of Mexico, Honduras, Nicaragua, and the Dominican Republic. In each country he will be joined by United States representatives already in Latin America on official duties. Completion of the assignment will bring to 11 the number of countries surveyed and should clear the way toward decision on a location. Earlier surveys covered sites in Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, and Venezuela.

Fruit Reports

Production trends and possibilities of the fruit industry in Argentina, Brazil, and Chile are discussed in Foreign Agricultural Reports 1, 2, and 3, recently issued by the Department of Agriculture. The author, *Fred A. Motz,* fruit specialist of the Office of Foreign Agricultural Relations, is now visiting fruit-growing regions of Mexico, obtaining material for another report in the series.

Cattle Event

From 1929 to 1936, *Albert O. Rhoad* taught animal husbandry in Brazil. Last month he returned to that country as a United States representative to consult with cattlemen of Brazil about the development of their dairy herds. High spot of the trip was the first Jersey cattle show in the history of Brazil, with the United States visitor as judge. Mr. Rhoad, as superintendent of the Iberia Livestock Experiment Farm at Jeanerette, La., is an employee of the Bureau of Animal Industry.

Agriculture IN THE *Americas*

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Quinine From the "Fever-Tree"

New light on the confused history of the cinchona tree, one of the Americas' most important contributions to the plant world, and something about prospects for replacing war-threatened sources with plantation production in our own hemisphere.

by WILSON POPENOE

In the year of our Lord 1633. the good padre Calancha wrote from a Peruvian monastery: "In the country of Loja there is a tree which they call the 'fever-tree.' the bark of which. ground to powder and administered in the form of a potion, cures fevers: there have been marvelous examples of this in Lima." The marvels were destined to grow with passing centuries, for the padre's tree was the cinchona. source of the almost-magic drug, quinine.

Today. quinine is one of the treasures of the Indies toward which Axis plunderers are driving their military machine. There is little production in the plant's native American home. Ninety percent of the entire world supply is either grown in the Netherlands East Indies or distributed through Dutch interests, which buy the crude bark from the growers for grinding. The Island of Java has long been the center of plantation production and since Amsterdam fell to the Nazis it has become the processing headquarters, as well.

Quinine is ordinarily used in the form of quinine sulfate, one of several alkaloids that may be extracted from cinchona bark. It is the best known specific in combatting malaria. Yearly United States requirements for the drug appear to total between 3,000,000 and 4.000,000 ounces. used principally by sufferers from malaria and to a lesser extent in other medicines. in toiletries and for culinary and beverage purposes. With military needs likely to grow. it can be seen that quinine is a strategic material of great importance.

Fortunately, the Axis threat to the main source of so valuable a product has not found the country unprepared. Substantial reserve stocks are reported to have been built up in this country to meet the immediate emergency. Scientists are at work on synthetic substitutes. And, in several Latin American countries, excellent progress is reported in a program to reestablish the cinchona tree in its native American habitat.

The discovery of the medicinal virtues of cinchona bark certainly ranks as one of the major events of South American colonization, and the story of how and when it occurred is a fascinating chapter in agricultural history, filled with confusion and contradiction that botanists have been trying to straighten out for three centuries. Bestowal of the name cinchona upon the tree is, in fact. a botanical comedy of errors. which is still being untangled.

The Author

Wilson Popenoe. formerly a plant explorer on the staff of the Department of Agriculture. is now in charge of research for the United Fruit Company and makes his permanent home in Antigua. Guatemala. He has recently been interested in the development of a vocational agricultural school in Honduras and is at present living in Tegucigalpa. His article. "American Ambrosia," appeared in the July 1941 issue of *Agriculture in the Americas.*

The account which until recent years has generally been accepted as authentic was placed on record by Sir Clements Markham, the English savant who played a prominent part in the establishment of cinchona cultivation in the eastern tropics. According to this account, an Indian of Loja, Ecuador, revealed the curative power of cinchona to the *corregidor* (magistrate) of that town, who in 1638 sent a package of the bark to Lima to the court physician, who supervised the health of the family of the Spanish Viceroy, the Count of Chinchón. The drug was administered to the Viceroy's wife, Doña Ana de Osorio and cured her of malaria. She is credited with carrying the good news, as well as some of the bark, back to Spain.

A New Version of an Old Tale

In recent years interested students, delving into dusty archives of Europe and Peru for further details of the story, have brought to light a version with a considerably different cast of characters. In 1938, the eminent Peruvian physician, Carlos Enrique Pas Soldán, published a little work entitled *Las Tercianas del Conde de Chinchón* (The Fevers of the Count of Chinchón), which not only alters the accepted tale considerably but it is in itself a literary gem.

According to Paz Soldán's version, the fourth Count of Chinchón arrived in Lima on January 14, 1629, to take up the important duties of Viceroy. He was accompanied by his second wife, Doña Francisca Enríquez de Rivera. His first wife, Doña Ana de Osorio, who has erroneously been involved in the traditional story of quinine, had died in Spain sometime during the year 1625.

The *Diario de Lima,* a chronicle of daily events, which was kept by a priest named José Antonio Suardo during the time of the Count of Chinchón, shows conclusively that the Viceroy was attacked shortly after his arrival by tertian fevers which during subsequent years repeatedly incapacitated him for work. Following the best medical practice of the day, the court physician, Dr. Juan de Vega, applied the accepted treatments. The Viceroy was bled and he was purged; he was purged and he was bled. Still the attacks continued and at one time the patient was so low that he prepared himself for death. Through these years the *Diario* of Padre Suardo, meticulous in its attention to detail, makes no mention of any illness suffered by the Lady Francisca, consort of the Viceroy.

In 1638 the Viceroy was suddenly cured of his fevers. On December 18, 1639, he transferred the authority of his high office to his successor and prepared to leave for Spain. The voyage in those days was a long one, via Panama and Cartagena de Indias (now Cartagena, Colombia). On reaching this last-named port Doña Francisca was stricken with a fatal illness, and the Viceroy continued home accompanied only by his young son. On reaching Spain he retired to his hereditary estate near Madrid and died there at 68, a ripe old age for those days.

The Viceroy Was the Patient

Attempting to harmonize the known facts, as brought to light mainly through the *Diario de Lima,* with the legendary tale of the discovery of the therapeutic value of cinchona bark, Paz Soldán argues with irrefutable logic that the Corregidor of Loja, who had learned the secret of quinine from the Indians, sent the precious bark to Lima to cure the Viceroy, not his consort. It was the latter, in fact, who administered the drug; the court physician clinging to the tenets of his profession, which did not permit the use of unknown remedies of the Indians.

Both versions of the tale are in agreement that the Indians knew the valuc of *quina quina,* as they called the bark, although there have been stories to the contrary. La Condamine, Jussieu, and Ruiz, early scientific travelers who visited the native home of the trees, all were of the opinion that the Indians gave the sccret to the Spaniards. In view of the extensive plant knowledge possessed by the more advanced native races of America such as the Aztecs, the Mayas, and the Quichuas (of whom the Incas were the ruling clan), there is little reason to doubt that this was the case.

The drug subsequently came to be widely used in Spanish America under the name of *cascarilla,* and one of its greatest advocates was Dr. Juan de Vega, the Count of Chinchón's court physician, who became convinced of its value despite his apparent skepticism whcn the drug was first brought to his attention in Lima. Its use was also greatly popularized by the Compañía de Jesus (the Jesuits), who were particularly active in making quinine known in Europe.

A Slight Case of Misspelling

One more unfortunate, if minor, incident marked cinchona's history. When the great Linnaeus came to include the plant in his published works, which formed the foundations of modern botany, he spelled the name *Cinchona* instead of *Chinchona,* an error which Sir Clements Markham later attempted unsuccessfully to rectify. Although the rules of botanical nomenclature prevent a return to the correct spelling, they do not preclude the pronunciation *chin-chó-na,* which is commonly used.

For two centuries the sole source of this valuable drug was the forests of the Andes from Colombia to Bolivia, in which the cinchona tree grows wild. Then, because of increasing scarcity of the bark and increasing apprecia-

The first stage in cinchona cultivation: the seed-bed, adequately sheltered from the sun.

Cinchona nursery-bed on a Guatemalan mountain. Plants will remain here about a year.

tion of its immense medical value, the Dutch and British governments began to take an interest in establishing cinchona plantations in their Asiatic colonies. In 1852 plants grown from seeds collected by Weddell in Bolivia were sent to Java; in 1854 these were followed by others from seeds collected by Hasskarl. Then in 1859 the British government made extensive plans for growing cinchona in British India, plans which were entrusted for execution to Sir Clements Markham.

The story of the search for the best cinchona trees in the Andes, an arduous and dangerous task carried out by the naturalist Richard Spruce and others, forms a romantic chapter in the history of quinine, as the drug eventually came to be known from its Indian name. Ultimate success was achieved when Charles Ledger, an Englishman who had lived in Peru and Bolivia for 20 years, obtained seeds of a superior strain which were sent to Europe in 1865 and were found in Java to produce trees of much higher quinine content than any which had been grown previously.

From these seeds have come the trees which form the basis of the extensive plantations, more than 45,000 acres, which today supply most of the world's quinine. Markham, a devoted admirer of the native races of America, has through his writings immortalized the name of Manuel Mamani, a Bolivian Indian who risked his life and finally lost it to secure the seeds which Ledger sent to Europe. Ledger's memory is kept green through the use of his name for the trees which have come from his seeds, trees known as *Cinchona ledgeriana,* now considered botanically to be a form of *Cinchona officinalis.*

The Cinchona Family

Most of the world's quinine is produced by the *calisaya* type of tree, native to southern Peru and Bolivia. *Ledgeriana,* or the Ledger form, is a type of *officinalis,* which latter is considered by some modern authorities to be the true botanical species—including the *Cinchona calisaya* of Weddell. Quite different in character is *Cinchona succirubra.* Its bark rarely yields more than 2 or 3 percent of quinine, while that of good Ledger trees commonly averages 7 percent or higher. *Succirubra* is mainly employed today as stock plant on which to graft the less robust *Ledgeriana,* although the former is cultivated to a limited extent for the production of barks used in the form of "quills," narrow strips which roll up on drying, for pharmaceutical purposes and for the medication of wines.

Quinine production is not completely extinct in the Western Hemisphere. For some years there have been small commercial plantations of *calisaya* in the moun-

tains of Bolivia, a country which in 1938 exported almost 2,000,000 pounds of cinchona bark to Europe. Plantings of *succirubra* were made many years ago and still exist (usually in a more or less abandoned state) in Ecuador, Colombia, Guatemala, and perhaps a few other countries. These sources, however, are at present far from sufficient to supply Western Hemisphere needs. That is why, as the world political situation has grown steadily more confused the last few years, the American governments and private American drug interests have fostered experimental work looking toward the development of quinine sources in those Latin American countries where conditions are favorable. These efforts have been concentrated on the plantation production of higher-yielding types of cinchona such as the Ledger. Guatemala has been the scene of the greatest activity, although experiments have also been started in Brazil, Venezuela, Colombia, Costa Rica, Mexico, and elsewhere.

Start From Scratch

Those concerned with cinchona culture in most of the countries mentioned have had to start from scratch. With the exception of a few vague memories of experiments conducted in Guatemala in the 1860's and of published information from Java, they knew little about the subject when they commenced work a few years ago. They did know that cinchona is not an easy tree to establish, since the varieties of high quinine content are extremely exacting in their requirements of climate and soil. They come from regions in the Andes where the mountainsides are covered with a thick layer of humus, the accumulated leaf-fall of centuries, and where clouds piling up from the lowlands keep the atmosphere moist a large part of the time. Successful establishment of commercial plantations thus depends upon utilizing areas which possess the proper conditions and upon growing kinds which are of relatively high quinine content. The Briton, Sir Frank Stockdale, admirably sums up the combination of factors required with the statement: "The problem for the cinchona grower is to find those conditions which promote the greatest degree of bark growth of reasonable quinine content in the shortest period of time."

Plantings were started in Guatemala at various elevations, from 2,000 to 6,000 feet, and on widely different soils. Much difficulty was experienced at first in propagating the high-yielding Ledger types. They are delicate trees which on their own roots require virgin soils, not too sandy in character, but at the same time not heavy. Furthermore, experience in Java has shown that they are not fully successful outside a certain altitudinal range, from about 3,500 to about 5,500 feet in that island.

The seeds (so small that it takes 2,500 of them to weigh a gram and around 75,000 to weigh an ounce) are planted in carefully prepared beds surfaced with forest loam and protected from sun and rain by means of sheet-iron or other roofing. While the seeds are germinating,

Nursery of *succirubra* seedlings, recently grafted with high-yielding plants of the Ledger race.

A seedling tree of Ledger cinchona, six years after it was planted in Guatemala.

a process which takes from 3 to 4 weeks, they must be kept uniformly moist but not wet. If allowed to dry out after they have swelled for germination, they die. Then there is the problem of protection from the damping-off fungus while the seedlings are small. This requires a very careful adjustment of light and ventilation. As the plants grow larger they must be given more light lest they become too "leggy," but if exposed to direct rays of the sun for even a few hours they may be killed.

Seed-Bed to Nursery to Field

From the seed-beds they are transplanted, when about 3 inches high, to nursery beds, with partial protection from the sun and after 6 months or so, again transplanted at wider spacings. It may require as much as 25 or 26 months to bring the young plants to a suitable size for transplanting to permanent positions in the field. During the early months in the nursery, many of them may die if not protected from heavy rains.

Because Ledgers are so delicate, it is the practice in Java to graft them upon roots of the more rugged *succirubra* species, unless the land on which they are to grow is unusually rich and of just the right soil texture. Grafting also furnishes an opportunity for standardizing the production, since grafted trees are relatively uniform in quinine content, while seedlings definitely are not. The selection of high-yielding mother trees for this purpose is another phase of the problem. At first glance it appears simple enough; one would think it necessary only to choose those trees which have the highest quinine content, a thing easily determinable by laboratory tests. But this is not the whole story. A tree which contains, let us say, 14 percent of quinine sulfate may be such a slow grower and have such thin bark that it would be more profitable to cultivate a tree which is a more rapid grower, with thick bark, but contains only 10 percent quinine sulfate. Other factors may also come into play, such as disease resistance, facility with which the variety can be grafted, and the like.

Harvesting With Mallets

The trees, whether produced by grafting or from seedlings, must have been in the field several years before any bark can be harvested. In harvesting, the trees are uprooted, and bark is removed by beating all parts of the tree—trunk, larger roots, and branches—with wooden mallets and then stripping it off by hand. The harvest is a progressive process, beginning about 3 years after final planting, when trees of inferior growth are taken out and their bark removed. This "thinning out" is repeated annually for a few years. As the planting advances in age, more mature trees are removed each year.

After cinchona trees reach a certain age, both the growth of the tree and the increase in quinine content of the bark slow down markedly. Javanese plantations, accordingly, operate on an 8-, 10-, 15-, or even 20-year rotation, whichever will bring about the most efficient quinine production under the soil and climatic conditions of a particular plantation. A 10-year schedule, for instance, would involve a plantation in which one-tenth of the total acreage would be felled for harvest yearly and an equal amount of land would be planted with young trees.

Preparation of the bark for market is simple. It is dried and then ground to a coarse powder for shipment to the manufacturers, who chemically extract the quinine and the minor alkaloids, cinchonidine, quinidine, and cinchonine. An outstanding contribution to the manufacturing process has recently been made by the Philippine Bureau of Science, which has had considerable success in the production of a drug called totaquina, which uses all the alkaloids of cinchona bark, is cheaper than quinine, and is said to be similarly effective against malaria.

It will be seen that the introduction of cinchona is not an overnight process. Ten years or more must elapse between the planting of seedlings and the peak harvesting of bark. The first commercial harvesting of bark from the new plantings in tropical America is still several years away and emergency production in that area must depend on increased harvesting from present wild trees. Progress to date indicates, however, that the Western Hemisphere can become entirely independent of Far Eastern quinine sources if that should be desirable.

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The highest standard-gauge railroad in the world is in Peru. At one point it reaches a height of 15,665 feet.

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Although Quito, the capital of Ecuador, is situated near the equator, it is noted for its cool climate.

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The Iguazú Falls, on the Brazilian-Argentine border, are double the height and width of Niagara Falls.

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Venezuela has 543,400 acres under coffee cultivation, yielding annually approximately 123,500 000 pounds of coffee, of which 30 percent is exported to the United States.

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Seven countries—Argentina, Brazil, Chile, Colombia, Cuba, Mexico, and Venezuela—account for approximately 85 percent of the total trade carried on by the Latin American republics.

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All twenty-one of the American republics eventually will be connected by the Pan American Highway. It will then be possible to drive from New York to Buenos Aires.

Small-Farm Rubber Production

In introducing plantation rubber culture in tropical America, great reliance is being placed in the ability of the one-family farming unit to produce crude rubber of top quality. A rubber scientist experienced in Central America tells how it is done.

by W. E. KLIPPERT

Until recent years, rubber culture has been regarded as an exclusive franchise of large companies, equipped to finance and operate plantations on a grand scale. The belief is still widely held, but it will not bear close examination, for the fact is that now more than half of the world's rubber supply is produced on small individually owned farms of less than 100 acres each.

Unfortunately, much of this small-farm rubber still goes to market in the form of so-called "wet sheets," ill-smelling slabs of partly dried rubber which must be re-milled into crepe rubber and dried before it can be used by manufacturers. At the same time, the swing toward producing first-quality crude rubber on small farms has definitely begun.

In the development of rubber production in Latin America, small plantings will undoubtedly play an important role. While government agencies and private corporations have already made large plantings in several countries of Central and South America, the plan is to encourage local farmers to use these central plantations as sources of material for their own plantings. In many areas, this adjacent expansion will contribute a major portion of the total rubber production.

Rubber differs from many agricultural products in that it is far from ready for market when it is "harvested." Planting the trees and bringing them into production are the first steps. Then the milk-like latex is taken from them by a process known as tapping. Finally, the latex must be transformed into dry rubber, the most common form of which is that of smoked sheets. While this may sound like a lengthy process, all of the steps are so simple that it may be carried out as readily on a small plantation as on a large one. There is, in fact, no tropical crop that is more suitable for small-farm production.

The Goodyear Rubber Plantations Company, aware of the ultimate place of the native land holders in rubber production in Latin America, has for several years tested small-unit rubber production on its Speedway Estate at Cairo, Costa Rica, using simple, inexpensive equipment of the sort available to almost any farmer in tropical America. This equipment consists of such materials as discarded kerosene cans and oil drums, bits of scrap metal, hand-made wooden paddles, and smokehouses of rough materials of local origin. Experience has shown convincingly that crude rubber of top quality can be produced in this manner with an investment in equipment of no more than perhaps $50, and in some cases much less.

In the establishment and maintenance of rubber trees, large company-financed plantations have been regarded as more economically feasible than small ones financed by the average family. This is because, once the trees are planted, from 5 to 8 years must elapse before they may be tapped and cash returns begin. Such a prolonged waiting period would seem to limit the enterprise to operators of substantial resources. In the Far East, however, it has been found that this apparent advantage is overcome by making double use of the land on small farms—reserving part of the land for food crops, or interplanting the rubber trees with root crops, bananas, cacao, coffee, rice, or other crops. These other crops supply both subsistence and a cash income for the grower while he is waiting for his rubber trees to mature. The interplanting is, moreover, a conservation measure, since it provides a ground covering that reduces erosion of the soil between the rubber trees.

The methods of selecting, planting, and culturing rubber trees follow good horticultural practices which are easy to describe and demonstrate. Once the initial steps in the establishment of a rubber tree planting have been taken it is then chiefly a matter of waiting until the trees are large enough to be tapped.

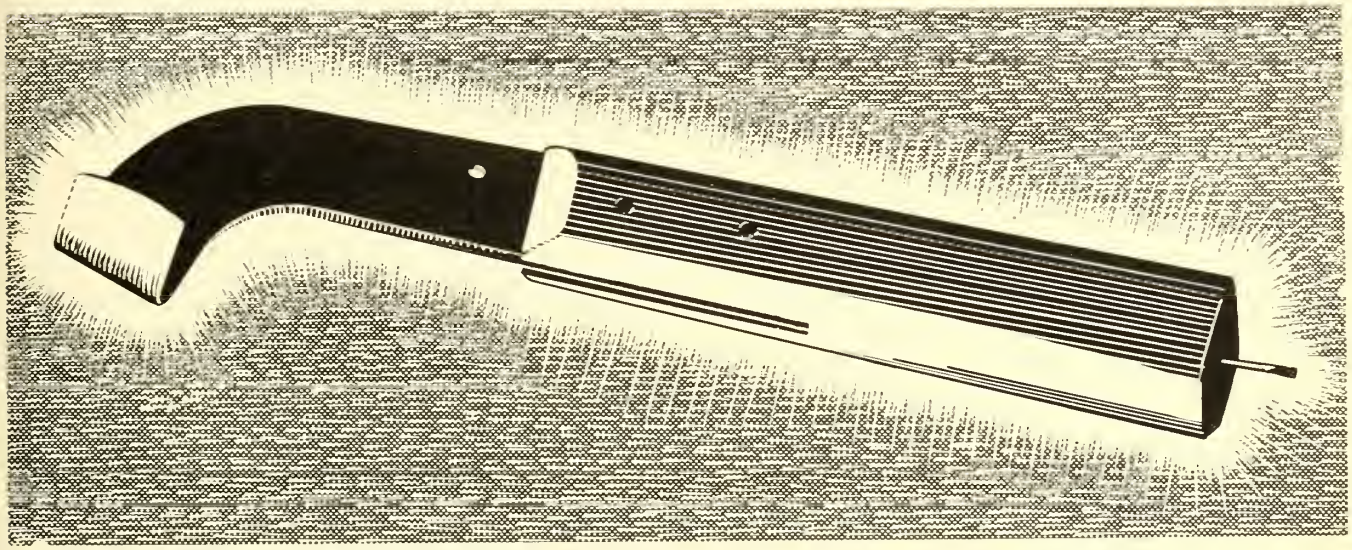
The operation known as tapping, by which the latex is obtained from a rubber tree, may be best characterized as a bleeding. An incision is made in the bark of the

The Author

Mr. Klippert is manager of the Goodyear Rubber Plantations Company's properties in Central America, where experimentation with tropical American rubber production has been carried on since 1935.

tree sufficiently deep to sever the latex vessels which are in the innermost portion of the bark. The scientific advancements which have been made in tapping procedure since the beginning of plantation rubber production are remindful of the advances in human surgery. In the early days the trees were butchered; now they are tapped with precision and care to safeguard their health and prolong their years of usefulness. Tapping tasks are of comparable size on both large plantations and small holdings. Once the tapper becomes familiar with the method through considerable practice and some supervision the tapping operation is carried on week after week as a relatively simple but rigidly systematic routine which appeals to most native workers.

Various types of knives have been used for tapping rubber trees. The one most suitable for tapping *Hevea* species and the one now generally employed both in the Far East and in Latin America is the "Jebong" knife illustrated in the drawing on this page.



This is the Jebong tapping knife, commonly used in rubber tree tapping today. The blade is shaped to cut a channel in the bark for the latex. Tapered nail in end of wooden handle is for checking depth of cut.

Tapping begins when the tree has a circumference of 18 inches at 3 feet from the ground, a girth it usually attains by the end of its sixth or seventh year. In preparing a tree for tapping, the worker outlines an area known as a tapping panel on the tree trunk. First the angle of the tapping cut is located on the tree with the aid of a rectangular piece of tin nailed to an upright stick so that its upper edge makes an angle of 30 degrees from the horizontal, the tin extending upward and to the left. The stick is cut about one meter in length to provide a convenient means of measuring the standard, uniform height above the ground of the lower right end of the initial tapping cut. In marking a tree for tapping, the worker holds the stick vertically against the tree, with its base on the ground. The flexible piece of tin is bent around the tree to the left, so that the guide line for the tapping cut can be marked on the tree with a nail scratch.

The tapping cut usually extends half way around the circumference of the tree, and its upper end is always to the left as the tapper faces the tree. (See photograph on page 51.) Shallow vertical grooves are made at both ends of the cut; on the upper end to indicate where tapping is to begin and on the lower end to provide a shallow channel down which the latex can run by way of a spout into a collecting cup. The tapping panel is this area bounded on the sides by the two vertical grooves and on the top by the downward curving line connecting them.

Once the panel is laid out, the initial tapping cut is made in the bark of the tree. Here the tapper's skill lies in his ability to cut deeply enough into the bark to obtain the maximum amount of latex from each tree without injuring the primary growing layer, known scientifically as the cambium, which lies between the bark and the wood of the tree.

When tapping begins on a new panel, several cuts are made to remove the bark gradually before the latex-bearing cells are reached. Thereafter only one cut is made at each tapping, and the tappings are done on alternate days. (Some estates use the full-spiral tapping system in which the cut extends on a descending spiral from left to right all the way around the tree. In this system, tapping is done every fourth day.) On each tapping day after the first, a thin shaving of bark is taken from the

lower edge of the previous tapping cut. Thus the bark is gradually removed as the position of the tapping cut moves slowly down the panel. In the best tapping, the thickness of the shaving removed each time is never more than 2 millimeters (about 0.09 of an inch). So little bark is removed, in fact, that a careful worker, tapping every other day, will proceed downward over the surface at a rate of not more than 2½ centimeters each month.

Close Cutting But Not Too Close

If tapping is so deep that the wood is exposed, wounds will result and after the bark has been renewed it will be difficult to retap the same panel. Good tappers cut not closer than within 1 or 2 millimeters of the wood, measuring the distance with a device which is made by driving a nail about a half-inch into the end of the handle of the tapping knife and then tapering the exposed head-end of the nail to a flat chisel-like edge similar to the point of a knife blade. By using this instrument to test the depth of the remaining bark as tapping progresses, the worker soon learns to obtain the best possible yield of latex without damaging the tree.

After tapping has progressed down one side of the tree to near the ground level (this should take 3 years or more), a new panel is started on the opposite side of the tree. Thus, from 6 to 7 years is allowed for the tapped bark to be renewed before tapping is repeated on any given side or panel.

When a tapping cut is completed, rubber latex seeps out of the cut and runs down the groove at the right side of the panel. A metal spout is used to guide the flow from this channel into a collecting cup. The spout commonly used is stamped from tin plate and is approximately 5 centimeters long and 2 centimeters wide. It is driven lightly into the bark so as not to touch the wood; otherwise, a wound may result through which diseases can enter. The spout is placed in the channel about 4 inches below the end of the tapping cut.

At the end of the spout is a collecting cup. To prevent damaging wounds, the edge of this cup is not driven into the bark as is the custom of some native tappers but the cup is suspended in a wire cup holder, which consists of 3-millimeter-gage wire twisted into a loop in which the cup rests. The wire is bent around the tree so that it is held in place by its natural spring, making it unnecessary to drive the ends into the bark. Cup holders can, of course, be adjusted to trees of various sizes.

Clay cups glazed inside are easy to clean and are usually regarded as the best for collecting latex. Coconut shells and calabash shells also are considered satisfactory if the inside surfaces are thoroughly smoothed and cleaned and then painted with two coats of rubber-base paint. From the cups the latex is poured into a collecting vessel, which may be a 5-gallon kerosene can with a handle of round iron. An improved type consists of a framework of strap iron in which a kerosene tin is placed.

All of this tapping and collecting is done early in the morning. Rubber trees yield a greater quantity of latex at that time; the frequent late afternoon rains, common in many rubber-producing regions, are avoided; and, furthermore, such a schedule makes it possible to give the rubber the further treatment necessary in the afternoon of the day it is collected. Accordingly, tapping begins as early as it is light enough for the tappers to see clearly, and collection from the cups starts by 9:30 in the morning.

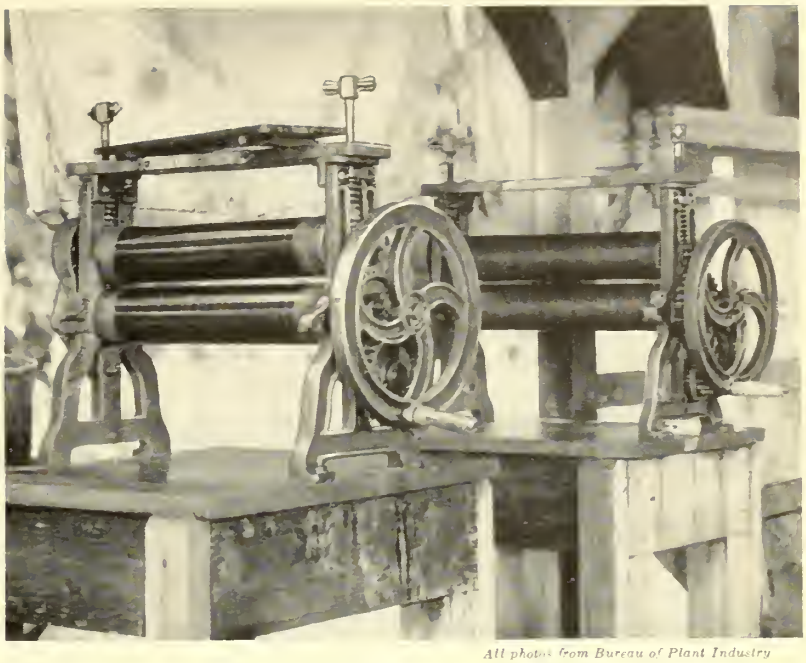
From the trees the latex is carried into the factory. Lest it be thought that the small grower disappears from the picture at this stage, it should be explained that "factory," as used in connection with crude-rubber production, means simply the building in which the latex is converted into smoked sheets of crude rubber for shipment. It is often little more than a lean-to. Under the small-grower system, one factory is used to prepare the rubber produced on one family's plantation or it is owned and operated cooperatively by several families. At the Speedway Estate in Costa Rica, a small factory and smokehouse have been maintained for several years, employing extremely simple equipment. Here is how the production of smoked sheet rubber is accomplished.

Straining the Latex

When the latex is first brought into the factory (photograph on page 51) it is passed through a coarse strainer made preferably of aluminum plate. This removes pieces of bark, dirt, leaves, and coagulated rubber. The strainer is mounted on a wooden frame of a size which fits the top of the kerosene can into which the liquid is poured. After this first straining there still may be fine particles of dirt in the latex. In order to remove these, another straining is necessary. To permit the use of a strainer which has a screen sufficiently fine to remove these, the latex is diluted with water—usually to a concentration of 12 percent of dry rubber, a solution which strains satisfactorily and handles well.

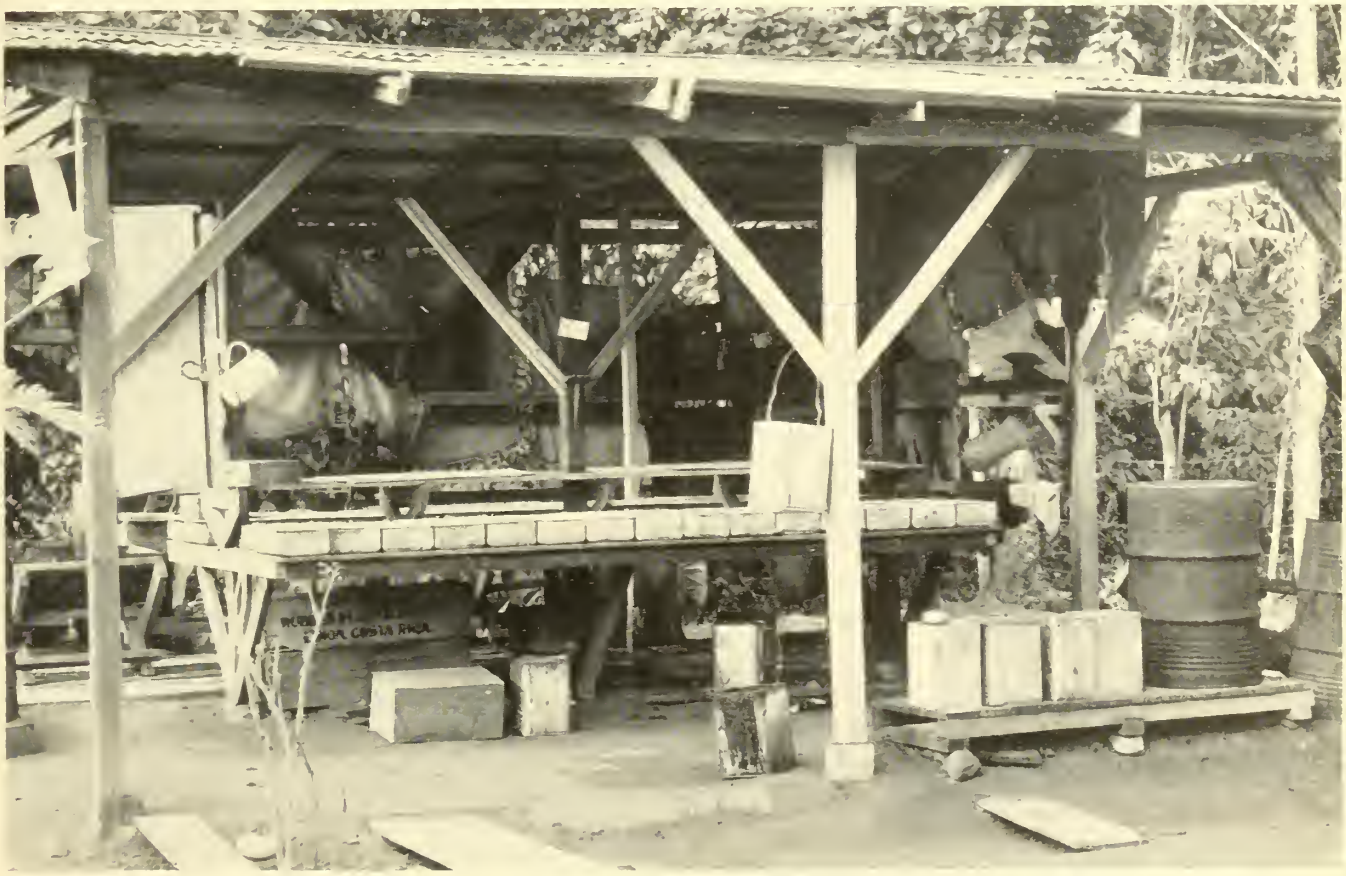
Most latex as it comes from the tree has a dry rubber content of from 30 to 35 percent. Latex of this concentration can be diluted to the desired 12 percent by adding one and one-half parts of clean water to one part of latex, and this is the practice followed in most small factories which do not have equipment for calculating the exact percentage of dry rubber. For more accurate dilution, special devices known variously as "metrolac," "latexometer," etc., may be used, and dilution may be made in accordance with a mathematical calculation.

Dilution is usually done in an old oil drum or similar container. After the water has been added, the latex is thoroughly stirred with a wooden blade in which holes



All photos from Bureau of Plant Industry

(Left) Good tapping by half-spiral method and good bark renewal. (Right) Hand rollers used by small planters for milling sheet rubber. Nearest is the milling machine and the other, the marking machine.



Small planter's type of factory for producing sheet rubber. Note that much of the equipment is improvised—coagulating pans from kerosene tins, oil drums used for latex dilution, etc.

have been cut. The solution is then poured into another container through a very fine strainer. This may be of "60-mesh" woven screen cloth, but most growers find it better to use a perforated plate of Monel Metal which, although its cost is higher, will last longer than any other type of material. To prevent clogging, all strainers are thoroughly washed in clean water immediately after use. Copper strainers are avoided because rubber is damaged by even slight traces of copper. After dilution and straining, the latex is left standing for about 15 minutes to permit any sand which might have been blown or washed into it during collection to settle to the bottom.

The next step is coagulation of the latex, and here again the lowly kerosene can comes into use. An inexpensive coagulating pan is made by cutting a kerosene tin in two in such a way that the length of the pans corresponds to the height of the original tin. Openings in the can are soldered shut, of course, and the cut edges are folded over and smoothed to prevent injuries to workers. In each coagulating pan so made, three liters of diluted latex can be coagulated. This quantity of latex gives a block of coagulum of convenient size and weight for handling in subsequent steps in the process.

When pouring the diluted latex into the pans, it is regarded as good practice to pass it once more through the fine strainer. This is facilitated by providing the strainer with a wooden frame which fits the top of the coagulating pan. The latex is dipped out of the dilution drum without disturbing the settlings at the bottom any more than is necessary.

In order to obtain the desired constituents from the latex, an acid is added as a coagulating agent as soon as practicable after the latex has been poured into the pans. The most satisfactory agent is formic acid, although if none is available, acetic acid is sometimes used, usually with less satisfactory results.

The proper amount of acid to be used varies with the age and condition of the trees and the percentage of dilution of the raw latex. It is also affected by the fact that occasionally ammonia or some other anticoagulant is used to avoid premature coagulation. In general, however, anticoagulants are not needed with latex taken mainly from old trees, and it is usually correct to use about 40 cubic centimeters of 90 percent formic acid per 100 liters of 12 percent latex. Before using the acid, however, the worker dilutes it by adding one part of 90 percent acid to 24 parts of clean water, always pouring the acid slowly into the water. Under the coagulation formula, about 30 cubic centimeters of this diluted acid are added to each coagulating pan containing 3 liters of diluted latex. The exact amount of acid to be used can be determined only by experimentation. The problem is to determine the quantity of acid that will coagulate all of the rubber in the 3 liters of latex without making it too brittle for rolling into sheets.

The acid is mixed thoroughly with the latex with a small piece of tin, in which holes have been cut. After the tin has been passed back and forth some 8 or 10 times, the worker skims off the accumulated foam, which would cause defects in the prepared sheet. The foam is sometimes coagulated later by adding a little acid and is made into a low-grade rubber.

After skimming the solution, the worker covers the pans with cardboard or other suitable material to keep out dirt. Coagulation usually takes place in about 2 hours, transforming the liquid latex into a tough, spongy, rectangular block of creamy white coagulum. In appearance, it resembles a brick cream cheese, one and one-half to two inches thick and slightly shorter and narrower than the coagulating pan. Water is added to the pans to help harden the coagulum and to prevent oxidation which would cause a discoloration of the exposed surface. Thus protected, the coagulm is left overnight.

Then Comes Milling

Next morning, this coagulated rubber is put through the process called milling which turns it into thin sheets. This is done with two hand-operated machines, one with smooth rollers to squeeze out the water and form the sheet and the other with marking rollers to give the sheet corrugated markings that increase the surface area and so facilitate drying. The sheeting machines, illustrated on page 51, are available through the agricultural agencies of the various federal governments interested in Western Hemisphere rubber production.

Since cleanliness is essential in preparing first quality sheet rubber, these machines are always set up near an adequate supply of clean water. The slabs of coagulum are passed through the smooth rollers from six to eight times, being rinsed in water after each passage. The adjusting screw on the machine is turned down slightly each time to force the rollers closer together. The sheet is rolled as thin as possible to shorten the time required for drying in the smokehouse. When the sheet is sufficiently thin, it is passed through the marking rollers—once only. The sheets are then washed in clean water and are hung on smokehouse poles to drain in a shaded place, never in the sun. Too much heat causes the sheets to become soft, misshapen and blistered, with a resultant reduction of their market value.

The sheets become surface dry in an hour or so and are then ready for the final step in their preparation—a smoking process which drives out all of the excess moisture. Smokehouses in which this operation is accomplished vary widely in form, size and type of construction. In a small factory, the unit may be merely a smoke cabinet of treated gunny sacking, roofed with palm thatching, or it may be a more costly but still far from elaborate structure made sometimes of wood and corrugated iron.

There is also a wide variety among the furnaces used in the smokehouses. An inverted oil drum is often made into a furnace by punching holes in the top and a door at the base to permit firing. If the water table of the land in the area is low, the furnace can be placed mostly below the ground level, a procedure which saves on costs because it permits lower smokehouse walls. Fuel is fed to the furnace through a trench which opens outside the smokehouse. The sheets of rubber are hung above the furnace on long poles, which usually are of bamboo an inch to an inch and a half in diameter. Thick-walled poles are regarded as more durable. Freshly cut bamboo is hardened for this purpose by placing the poles completely under water for 2 to 3 weeks and then burning out the decayed heartwood with a heated steel rod.

Smokehouse workers have to be extremely careful in this final stage of the curing process. They must hang the sheets high enough above the furnace to avoid damage from fire or overheating. The furnace must be fired carefully so as not to cause clouds of ashes to rise and settle on the drying rubber. The wood in the furnace does not burn brightly, but smoulders, thereby producing both heat and smoke. All smokehouses have ventilated openings at the top and bottom for controlling the temperature and movement of the air during drying.

Care is taken that the temperature in the smokehouse does not go above 50 degrees centigrade, since a higher temperature will blister the sheets. When fresh sheets are placed in the smokehouse, an even lower temperature (about 40 to 45 degrees) is regarded as desirable. Some workers prefer to maintain the latter temperature range throughout the drying process, with plenty of ventilation to facilitate drying, since it is not the heat alone which dries the rubber, but a combination of heat and good ventilation.

After about 3 days the sheets will become translucent and will no longer contain the dense white patches characteristic of incompletely dried rubber. They are then inspected by holding them to the light. Any large specks of dirt are clipped out with shears, and the sheets are brushed with a wire brush to remove splinters or other foreign matter adhering to the surface.

Next, the sheets are graded according to market types and are packed in bales which contain only one grade of rubber. A standard size bale, illustrated on this page, is 19 by 19 by 24 inches and contains a volume of 5 cubic feet. Bound with steel strapping and covered with burlap or cotton cloth, the bale is ready for shipment.

That is the process of rubber production on the small farm—from tree to bale. Not every grower succeeds in producing top-quality rubber sheets at his first try, but he soon learns to recognize defects in the sheets and to know how to correct them.

He finds, for instance, that small bubbles along the edge of the sheet usually are due to insufficient mixing of the acid with the latex or to the use of too little acid. Small bubbles appearing in patches or clusters in the sheets usually indicate a lack of cleanliness at some point in the preparation. Irregular bubbles and whitish specks scattered over the sheet are caused by the latex coagulating before it reaches the factory, a common occurrence

Bale of smoked sheet, pressed and ready for burlap wrapping preparatory to shipment.

if rain falls during the tapping period. Large bubbles and blisters in the sheets are almost always caused by excessive heat in the smokehouse.

In addition to these various arrays of bubbles, several other defects are readily recognizable. If sand appears in the sheets, it indicates either that the diluted latex has not been permitted to stand long enough after dilution or that care was not exercised in dipping the diluted latex from the settling tank. Dirt and bark in the sheets result either from insufficient straining of the latex or from carelessness in handling after it has been strained.

Most of the defects in sheet rubber can be eliminated by care in keeping all equipment absolutely clean. When this is done, any small grower anywhere in tropical America can produce smoked sheet rubber of the highest grade, which will bring top prices in any of the world's markets. In successful rubber production the larger plantations possess no magic wand. Good trees and time-tested methods produce the same good product for all.

Farmer Co-ops in Argentina

The agricultural cooperative movement, off to a slow start in the land of the Pampas, spurted during the depression and still retains its momentum. Today, 300 democratic associations serve producers of practically every major farm crop in the country.

by ELIZABETH B. MELVIN

Farmers in Latin America, as elsewhere, form cooperatives to get rid of the "in-between" man. In the place of this middleman, they set up a combination store, market, factory, insurance company and bank to take care of their business.

Practically every Latin American Republic either has farmer cooperatives or has laws making their organization possible. One of the oldest systems is that of Argentina, which initiated the movement before the turn of the century and today has almost 300 agricultural cooperatives. Half of them are of the "mixed" type, combining two or more of the usual cooperative functions. About a tenth of them perform all five services.

They are truly democratic, these Argentine cooperatives. The laws of the country permit no restriction on admission of members, amount of shares of stock or working capital. That means that the man who owns 10 acres of land can become a member and vote just the same as the farmer with 10,000 acres. Children over 18 years of age and married women may join without asking their parents or their husbands. Furthermore, they may dispose of their property in the cooperative as they choose.

Suppose a farmer hauls his milk to his cooperative early in the morning. He wants to take home a sack of flour, a bag of feed, and maybe a few other groceries, such as sugar and butter. But, according to Argentine law, he must pay cash for all articles of consumption. His cooperative simply asks him to step over to another section of the building and exchange the current market value of his milk for what he wants to buy.

Aside from this difference, Argentine cooperatives function much the same as those in other countries. They pay their members the common market price for products. At the end of the year, in accordance with law, they put at least 5 percent of the net income into a reserve fund and return 90 percent to the members as patronage dividends, according to the volume of business each has done. Cooperatives are not allowed, however, to have any business dealings with nonmembers.

Argentina, in size about a third as big as the United States, is strictly a farming country. Grain and livestock together make up 95 percent of the nation's exports. So it is not surprising that a hail-insurance cooperative, El Progresa Agrícola, started off the cooperative movement in 1899 in Pigüe in the Province of Buenos Aires. The next year the first mixed cooperative, the type now so prevalent in Argentina and so well suited to the type of farming done there, was organized in the Province of Entre Rios. This cooperative, La Agrícola Israelita, states in its statutes that its purpose is "(1) acquiring knowledge and skill in agricultural matters, (2) forming a Savings and Loan Bank, and (3) acquiring machinery and equipment at reasonable prices." In the 12 years following, 13 more cooperatives of this type and 6 additional hail-insurance companies were formed.

As in the United States, cooperation was slow getting started. One of the problems is that of the tenant farmer. A major part of the cultivated land is held by large landowners, many of whom either live in Buenos Aires or are absent from their farms a great part of the year. The tenants, who usually furnish their own equipment, must turn over almost a third of their crops to the owner. Since the price of land is relatively high, many of these tenant farmers cannot hope to acquire holdings for themselves. Isolation and lack of information are two other factors that have held back the cooperative movement. But with the coming of better roads and the information service of the Registry for the Inspection and Encouragement of Cooperatives, a branch of the Ministry of Agriculture, cooperatives have taken a step forward.

The Author

Mrs. Melvin, a former newspaperwoman, is now a writer in the Information and Extension Division of the Farm Credit Administration, U. S. Department of Agriculture. She has written a number of bulletins about the agricultural cooperative movement in the United States.

The greatest progress in the Argentine cooperative movement was reached in the early 1930's, when the world-wide depression seriously reduced the purchasing power of farmers and caused them to seek new means of reducing expenses. Government encouragement of the movement was also increased at this time. After reaching a peak in 1932, the number of cooperatives declined almost half in the next 6 years, but the number of members was not greatly reduced and operations more than doubled.

By 1938, there were 138 mixed agricultural cooperatives, 78 dairy cooperatives; 29 wine, fruit, and vegetable cooperatives; 20 cotton cooperatives; and 13 yerba mate and tobacco cooperatives. These 278 associations had a total membership of 42,182, a combined capital of 11,818,540 pesos, and an annual business turn-over of 84,759,167 pesos. In addition there are 7 insurance companies and 7 other cooperatives, mostly of the credit type.

Practically all the mixed type cooperatives are situated in the "breadbasket" provinces of Buenos Aires, Santa Fe, Córdoba, and Entre Rios, and the Territory of La Pampa. The treeless level plains with their deep and fertile soil, a temperature varying only 26 degrees between winter and summer, and an average rainfall of 38 inches distributed evenly throughout the year are ideal for growing wheat, corn, and flax. Cattle, too, thrive on the grass-covered sections of these plains.

Commerce in grain constitutes the principal activity in 106 cooperatives. Among the services they perform for their members are threshing, hauling the products to the cooperative or the railroad station by truck, and supplying harvesting equipment. Each cooperative selling grain has its own method of operation in accordance with local circumstances. Almost all of them, however, follow one of two systems—individual selling of each member's grain or collective selling.

In the case of individual selling, the member turns over his crop to the cooperative and receives a statement showing the amount of grain delivered. Most cooperatives take samples from each bag at time of delivery and mix all these samples together, then take a joint sample and divide it into three parts—one for the member, the second for analysis immediately, and the third for the cooperative in case of complaint or request for a new test. The analysis is made in the presence of the member and the results are placed on a record which is signed by both the member and an employee of the cooperative. The member notifies the cooperative when to sell the grain, which it does, settling his account at once.

For collective selling, the grain is received in the same manner. The only difference is that the cooperative pools the grain after separate analyses are made and decides when to sell it instead of waiting for the member's notice. The cooperative settles with its members at the end of the season after all the grain is sold. In case a member needs money, the cooperative advances it to them out of the final settlement. The cooperatives either make their sales almost automatically as the grain comes in or else sell at irregular intervals, taking advantage of high prices. Only one cooperative has established weekly sales in quantities previously decided upon.

Creameries are the most common single-activity co-

Photo courtesy Pan American Union

Warehouses of the Agricultural Cooperative Society at Leones, one of Argentina's active co-ops.

operatives. The 78 creameries in 1940 had a total membership of 3,000 and a capitalization of more than 1½ million dollars. Usually they produce cream as their principal product and casein as a byproduct. As a means of using the buttermilk and other residue, they often raise hogs.

The creamery makes an analysis of the butterfat each day and notes it, together with the quantity of milk received, on the receipt given each member. The milk is run through the separator and the cream is sent to the cooperative butter or cheese factories the same day. At the end of the month each member is paid on the basis of the butterfat in his milk. An annual balance is kept and the income resulting from the sale of casein and hogs, together with the surplus butterfat sales, is distributed to the members in proportion to their business. First, however, at least 5 percent of the total income is deducted for a surplus fund, in accordance with cooperative law.

Another single-activity cooperative, the only one in which the government has an interest, is the Official Cooperative of Mendoza founded by a Provincial law in 1923. The government is a stockholder in this wine cooperative with a permanent representation of two members on the board of directors. In 1940 its membership totaled almost 400 and its sales were close to a million dollars.

The 29 wine, fruit, and vegetable cooperatives are practically all in the west central region in sight of the

snow-capped Andes. Irrigation is necessary to raise crops because the average rainfall ranges from only 3 to 11 inches. The temperature varies widely, also.

The 20 cotton cooperatives in the humid subtropical Chaco section in the north engage in a number of activities, but their outstanding function is to gin and sell their members' cotton. In 1935 the National Cotton Board was established. Among its projects is the building of cotton mills along cooperative lines. A few oil mills have been set up recently to utilize the cotton seed from the gins. The tobacco and yerba mate cooperatives are mostly in the Chaco section, too. These cooperatives process their products for marketing, as well as market them.

The movement to form confederations or unions of cooperative organizations is comparatively new in Argentina. In 1940 there were five groups or unions of agricultural cooperatives, of which the oldest is the Association of Argentine Cooperatives, established in 1922 in Rosario, Province of Santa Fe. It combines agricultural organizations situated principally in the grain belt and prints a weekly eight-page newspaper, "La Cooperación." Approximately a third of the total number of producers in this province are members of cooperatives—the highest percentage in any province in Argentina.

Another type of intercooperative organization, unique in this class in Argentina, is the Butter Cooperative Union of San Carlos Centro in the Province of Santa Fe. It is the center for four cooperative creameries and its only function is to manufacture the cream of its affiliated cooperatives into butter and market it. At Sunchales in the same province another cooperative butter factory of this type is being organized.

Any cooperative may obtain credit from the Banco de la Nación or the National Mortgage Bank. The National Mortgage Bank is also authorized to make loans up to a maximum of 25,000 pesos to cooperatives for the construction of warehouses, elevators, and creameries, and also for the purchase of land to be transferred to the society's members for the construction of houses or farm buildings. Loans may be made up to 80 percent of the estimated value of the land or building. The law also provides for the free grant of land beside railways for the construction of cooperative warehouses and elevators. Certain exemptions from taxation are made for cooperatives, also.

All cooperatives are subject to a double inspection. The National Bank handles the inspection of rural credits, but the Registry for the Inspection and Encouragement of Cooperatives, a branch of the Ministry of Agriculture, audits their accounts. It also keeps a special register of cooperatives and their statutes, maintains an information service, and collaborates in forming cooperative laws.

The cooperative way in Argentina is still comparatively new, but the movement continues to spread throughout this land of vast plains, snow-capped mountains, and sun-drenched valleys.

Reading
ABOUT THE AMERICAS

Pan American Spanish, Agnes Marie Brady; 472 pp., D. Appleton-Century Co., New York, 1941. Provides means of learning more about Latin American countries while acquiring greater facility in Spanish.

Iberoamérica, Américo Castro; 267 pp., The Dryden Press, Inc., New York, 1941. A second-year text for North American college students. Accent on Ibero-American civilization, past and present, and a chapter in English on population, production, and trade statistics.

The Economic Defense of the Western Hemisphere; A Study in Conflicts, W. P. Everts, Ed.; 170 pp., American Council on Public Affairs, Washington, D. C., 1941. A symposium of the Latin American Economic Institute with contributions by R. F. Behrendt, John E. Normano, Fred Lavis, H. B. Davis, Rodrigues Silva, E. B. Dietrich, Scott Nearing, and the National Planning Association.

Compendio de Historia Hispanoamericana, Roy Temple House and Carlos Castillo, Eds.; 315 pp., Scott, Foresman & Co., Chicago, 1925. Easy Spanish reading.

Present Day Spanish (revised edition), Bernard Levy; 376 pp., The Dryden Press, Inc., New York, 1941. A combination of composition book, reader, and review of grammar—intended for intensive study.

American City Series, Pan American Union, Washington, D. C. Booklets on the capitals of all the American Republics and other principal cities of some. The individual booklets are revised and brought up to date at intervals.

American Nation Series, Pan American Union, Washington, D. C. Booklets on all the Latin American countries containing basic data and descriptive matter. Revised at intervals.

The Pageant of South American History, Anne Merriman Peck; 405 pp., Longmans, Green & Co., New York, 1941. Another story of South America, from the ancient civilizations to the modern republics. Illustrated with 15 photogravures and 5 maps.

ALONG THE *Agricultural Front*

▲ Peru Reorganizes Its Agricultural Bureau

In order to achieve a more extensive agrarian program. Peru's Bureau of Agriculture and Livestock has been reorganized and now includes four new divisions. These are a Division of General Inspections of Agriculture and Livestock, a Fruit Section, a Commercial Department, and a Farm Cooperative Section.

In addition to the creation of these agencies which will provide scientific, marketing, and cooperative information to Peru's farmers, the Bureau of Agriculture and Livestock is encouraging the development of crops other than cotton and sugarcane. This program includes a flax campaign with an expected cultivation of 23,000 acres and the distribution of hemp seed.

▲ U. S. D. A. Diet Plans Studied in South America

Diet plans worked out in the United States are being studied and adapted in South America, according to Dr. Hazel K. Stiebeling, food economist of the U. S. Department of Agriculture.

Dr. Simón Mendivil, Chief of the Bolivian Department of Nutrition of the Ministry of Labor, Health and Social Welfare, has written Dr. Stiebeling that educational, military, and administrative authorities of Bolivia have shown considerable interest in a number of Bureau of Home Economics publications. One of them, "Planning Diets by the New Yardstick of Good Nutrition," has been translated into Spanish to facilitate its use.

This publication consists of four master diet plans given in terms of groups of foods. The plans are keyed to three different levels of expenditure—modest, moderate, and generous.

Dr. Mendivil also requested special follow-up information about composition of garden vegetables and ways of preserving them to be used in establishing a sufficient supply of perishable vegetables for the National Officers' Training Center at La Paz, Bolivia.

▲ Venezuela Seeking to Conserve Its Forests

In order to conserve Venezuela's forest resources, the government of that country has recently issued a decree regulating exploitation of lumber and charcoal. In addition, the government is encouraging the substitution of kerosene for charcoal as fuel, and oil companies are seeking to reduce the cost of producing and distributing petroleum products so that fuel prices may be within reach of the country population.

Charcoal has been the only domestic fuel used in Venezuela for many years, with the capital city of Caracas alone consuming approximately 60,000 tons of charcoal a year. Since 5 kilograms of wood are required to produce 1 kilogram of this fuel it is necessary to destroy 300,000 tons of wood a year, or 1,200 trees a day, merely to supply Caracas. While Venezuela's forest resources are great, lack of conservation has in recent years made the control of rivers extremely difficult.

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Chile leads the American continent in copper exports.

▲ U. S. Chapter of A. S. A. S. Elects

The United States Chapter of the American Society of Agricultural Sciences organized for 1942 with election of officers at its January meeting. Dr. Earl N. Bressman, director of the Agricultural Division of the Office of Inter-American Affairs, was reelected president. The former secretary, Howard P. Barss of the Office of Experiment Stations, Department of Agriculture, was elected to the new office of vice president. The new secretary is Dr. John H. Provinse of the Bureau of Agricultural Economics, Department of Agriculture.

▲ Oil Extracted From Tomato Seeds

From Brazil come reports that the composition of the tomato seed has been analyzed and it has been determined that the oil content has commercial value. In addition to being nutritious on account of its high vitamin content, the oil can be used as a drying agent in the manufacture of varnish. It is said that 18 percent of the oil can be extracted, leaving a nutritious residue for animal consumption and organic fertilizer.

▲ New Industrial Plant Established in Brazil

To manufacture bags in which the native fiber *Guaxima* will be used, in combination with jute, a factory has been established at Victoria, in the State of Espirito Santo, Brazil.

The new industrial plant has an annual capacity of 1,500,000 bags. The fiber is obtained from plants growing chiefly in the Amazon Basin.

▲ American Plant Science Articles Published

A series of 100 articles on plant science in Latin America is now being published in "Chronica Botanica," the international plant science

news magazine published at Waltham, Mass., by Dr. Frans Verdoorn. The first articles appeared in the November 1941 issue, and they are being continued in 1942.

The aim of the series, says the publisher is "to give the agronomist, botanist, forester, phytopathologist, etc., information which he may need when starting work on the wild or cultivated plants of Latin America. It is hoped that it may be still more useful for those who plan to go to Latin America to collect or to conduct research. In addition to data in his own field, the specialist will find information on vegetational and agronomic problems in general, on the organization of research, lists of books that he might consult, and names of other scientists who are working in the territory."

The articles are being written by recognized authorities in all branches of plant science and, in general, will appear in the native language of the author. The series will include a directory of plant science institutions and societies and an address list of research workers in the Americas.

▲ Peru Encouraging Farm Youth Clubs

The government of Peru, seeking to encourage the formation of farm youth clubs, has published, through the Ministerio de Fomento, a printed pamphlet entitled "Consejos para la Organización de Clubs Agrícolas Escolares." In addition to original material discussing the value to Peruvian agriculture of farm youth organizations, the pamphlet includes a translation into Spanish of U. S. Department of Agriculture Miscellaneous Publication No. 320, "The Organization of the 4-H Club."

▲ Panama to Study Cost of Living

An official Commission has been appointed to study the cost of living in the Republic of Panama, according to a report by Ashley B. Sowell, U. S. Commercial Attaché. Two factors are responsible for the change in Panama's agricultural economy: the exodus of farmers to seek employment on the Panama Canal, accompanied by diminished agricultural production and a simultaneous increase in consumer demand; and an increase in transportation charges reflected in the cost of important consumer goods.

The Commission, representing government, business, and consumer interests, has been instructed to study the cost problem for 60 days and to reduce its research to recommendations.

▲ Motor Fuel Produced From Sugarcane

Experiments conducted at Louisiana State University by Dr. J. W. Jean have led to production from blackstrap molasses of a motor fuel called Jeanite. While not competitive in price with gasoline, the product is believed to have potential value for the several American republics which have no petroleum but do have extensive sugarcane industries.

Most other experiments in the use of grains and similar products for motor fuels have involved the production of alcohol for blending with gasoline. The new process avoids the objections of this procedure by producing entirely from molasses a fuel which is practically identical with gasoline in fuel value and octane rating.

▲ Plan to Remedy Lack of Shipping Facilities

In order to expedite agricultural and industrial exchange between the Americas, a Commission of Experts on Maritime Affairs has been formed to make plans for the efficient use of foreign flag vessels lying inactive in the ports of the American continent. Members of the Commission are Don Augustín Huneeus of Chile, Ambassador Ernesto Jaén Guardia of Panama, Mario Collazo Pittaluga of Uruguay, and Lloyd Swayne of the U. S. Maritime Commission, with Dr. Héctor David Castro, Minister of El Salvador, serving as Chairman of the newly created body.

The plan is that the vessels now lying in American ports shall be utilized to promote the defense of the economies of the American Republics as well as the peace and security of the continent. Functions of the commission will include making recommendations for the allocation of particular vessels to the several trade routes; diversion of at least minimum shipping facilities to those nations not adequately served; and efficient scheduling where more than one shipping line serves an individual port or nation.

▲ Paraguay Seeking to Redistribute Land

The Republic of Paraguay is undertaking a program for redistribution of land through an "Agrarian Statute" designed to provide every Paraguayan with "a piece of land of his own on which to construct his home and produce the necessities of life, and to increase the acreage of various crops."

AGRICULTURE IN THE AMERICAS ROBERT H. INGRAM, EDITOR

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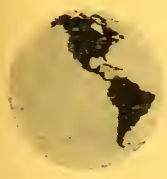
Luis Fernando Guachalla

OUR MUTUAL FRIEND



On a plateau 12,000 feet high, where the Andes Mountains reach their greatest width and part into parallel ranges, lies the heart of Bolivia, third largest country in South America. From this Andes-ribbed republic, named for Simón Bolívar, the liberator of half a continent, comes Luis Fernando Guachalla to represent his native land in international councils as Minister to the United States.

Born in La Paz, highest major city in the world, Bolivia's Minister started his diplomatic career in neighboring Chile at the age of 22. After advancing from third secretary to chargé d'affaires, the young diplomat returned to his birthplace as second adviser to the Minister of Foreign Affairs. Earning a legal degree from the University of Chile, he served as professor of international law in the University of La Paz.

A new appointment took him to next-door Paraguay as Bolivia's Minister in 1930 and 1931. Three years later he entered the President's cabinet as Minister of War. His knowledge of international law opening new fields, he soon became Undersecretary of Foreign Affairs and later Minister of Foreign Affairs. In 1936 came his appointment to Washington as Bolivia's Envoy Extraordinary and Minister Plenipotentiary—the same position his father had held in 1901 and 1902.

Dr. Guachalla's career is studded with such decorations as the Grand Cross of the Condor of the Andes, the Chaco War Cross, the Order of the Sun of Peru, and the Order of Military Merit of Bolivia.

With Bolivia assuming an ever-expanding role as a supplier of military raw materials, announcement has been made that its Legation in Washington is to be advanced to Embassy rank. When this step is officially confirmed, Dr. Guachalla will assume the new title and duties of an Ambassador, a position for which he is eminently fitted by his diplomatic, legal, and scholastic attainments.

South America's Ports

South America, with more than 12,000 miles of coastline on two oceans, is fringed by ports, which cast lifelines into the interior and draw from it minerals, foodstuffs and raw materials for foreign trade.

Southward along the Pacific from the Panama Canal, the first major port is Buenaventura, Colombia's western outlet. Two degrees south of the equator is Guayaquil, Ecuador's chief port and largest city. Callao, gateway to Peru's capital, has one of the best harbors on the west coast and is only eight miles from Lima.

In northern Chile is Arica, through which imports enter for Bolivia and Peru, as well as Chile; then come mineral-exporting Iquique and Antofagasta. Midway down the coast is Valparaiso, which with 245,000 people is the largest Pacific port south of San Francisco. At the tip of the continent, where two oceans rage through the Strait of Magellan, ships dock at the Antarctic outpost of Punta Arenas for cargoes of wool and mutton.

Through the Straits and up the Argentine coast, a thousand-mile stretch without major ports ends at Bahía Blanca, shipping center for a vast agricultural area. Four hundred miles north are Buenos Aires, Argentina's thriving capital and chief port, and its neighbor city, La Plata. Both lie in the wide mouth of the La Plata River, on the opposite shore of which is Montevideo, capital of Uruguay. These three ports account for a large part of the world's exports of grain and meat products.

Three hundred miles up the Atlantic coast is Rio Grandė, Brazil's southern port. Above lies Santos, leading coffee port of the world, and gateway to São Paulo, Brazil's second largest city. Farther north is Rio de Janeiro, Brazil's capital and commercial center with a population of more than 2,000,000. Portals of Brazil's "bulge" are Bahía and Recife, and far to the northwest is Belém, from which many of the products of the Amazon reach world markets.

Passengers and freight enter Venezuela through La Guaira, port for Caracas. Farther along the Caribbean shore is Maracaibo, principal export center for Venezuelan coffee and oil. Between the Venezuela-Colombia border and the Isthmus of Panama lie Colombia's principal Caribbean outlets, Barranquilla, reached from the sea by a seven-mile journey up the Magdalena River, and Cartagena, once the most heavily-fortified stronghold in Spanish America.

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Agriculture in the Americas

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IN THIS ISSUE

April 1942

Conference in Mexico

The Americas, food arsenal of a warring world, will marshal their agricultural forces at the Second Inter-American Conference of Agriculture July 6 to 16 in Mexico City. Pan American Union is the planning agency; all the Republics will participate.

Everyday problems of agricultural production in the Americas will not be neglected, but will yield precedence to discussions of present-day and post-war needs. Rubber, fibers, oil, and medicinal plants are on the program, along with grains, fruits, coffee, and sugar, the traditional basic crops. The Conference will study agricultural resolutions of the Rio meeting of foreign ministers and propose measures for applying them.

The First Inter-American Conference of Agriculture met in Washington in 1930.

Day of the Americas

Pan American Day, dedicated to inter-American solidarity and friendship, will be observed throughout the Americas on April 14, as it has been each year since 1931.

The Day of the Americas falls on April 14 because on that date in 1890 the Commercial Bureau of the American Republics, forerunner of the Pan American Union, was established at the First International Conference of American States. Official observance, based on a resolution of the governing board of the Pan American Union, has grown steadily in scope. In 1941, more than 12,000 requests for material were received from schools, communities, clubs, newspapers, and radio stations.

Anticipating record-breaking participation this year, the Pan American Union points out: "Inter-American cooperation was never so important as it is at the present time. The bonds which link the nations of the Western Hemisphere for the defense and preservation of freedom can be no stronger than the ties which unite their peoples."

Dairy Adviser

Responding to a request of Holstein cattle breeders in Latin America for advice in perfecting their herd registration system, *Alvin C. Oosterhuis,* president of the Holstein-Friesian Association of America, is now traveling in the southern Americas. When he returns to the United States, he will have visited Mexico, all the countries of Central America, Colombia, Ecuador, Peru, Bolivia, Argentina, and Venezuela. First reported result of his trip is the organization of the Association of Holstein Cattle Breeders of Guatemala.

Coordinators

To assure maximum effectiveness of government activities aimed at increased production in the Western Hemisphere of the raw materials of war, the Inter-Agency Coordinating Committee on Strategic and Critical Materials has been established. Represented are the Board of Economic Warfare, War Production Board, Federal Loan Agency, and Departments of State, Interior, and Agriculture. Chairman is *Paul H. Nitze,* Associate Director of the Board of Economic Warfare's American Hemisphere Division, which also functions as a part of the Office of Inter-American Affairs. Agriculture's representative is *R. H. Allee* of the Office of Foreign Agricultural Relations.

Agriculture IN THE *Americas*

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Accent on Sugar

The surplus problems of sugar date back to the aftermath of World War I and have not been ended by developments so far in the present war. Here is the story of sugar as a basic crop of the Americas and an account of some factors in the current situation.

by GUSTAVE BURMEISTER

When sugar turned up on newspaper front pages as the first food product to be rationed in the United States in the present war, it was appearing on a familiar stage but in an unfamiliar role. Sugar is no stranger to the headlines, but during recent years it had usually made news as a surplus product and because of efforts to control overproduction.

What may seem to be an about-face is nothing of the sort. While several emergency factors make it necessary to conserve our present supply, sugar is definitely one of the surplus commodities of the Western Hemisphere. During recent years production of sugar in the Americas, including Hawaii, has exceeded consumption in the same area by an average of a little over a million tons a year, the major part of which has been customarily exported to Europe. The Hemisphere imports practically no sugar except from the Philippine Islands and could be entirely self-sufficient almost immediately if conditions were normal and no considerations except supply and demand were involved.

Of course, conditions are not normal, and many questions that have little to do with economics figure in the present sugar situation. Currently, sugar prices are somewhat higher than the average of recent years. With the shipping situation so uncertain, however, it certainly cannot be said that the war has ended the surplus problems that have long plagued Latin America's important sugar industry. Moreover, producers are giving a thought to the post-war situation, for it was the aftermath of World War I that precipitated many of the sugar problems of the last 20 years.

In the Americas, sugar is produced both from sugar beets and sugarcane, crops which were borrowed from the eastern world. The early history of sugar as a sweetening is obscure, but the majority of evidence points to India as the country of origin of cane production and sugar manufacture. White sugar is said to have been shipped from India to Europe as early as 500 A. D. The crop was introduced into the West Indies in the late fifteenth century soon after the arrival of the Spaniards and gradually spread throughout the American tropics. The presence of sugar in beets was discovered in Germany in 1747, and by 1875 a sugar-beet industry had become permanently established in the United States. There is no chemical difference between sugar produced from cane and that which comes from beets.

The Western Hemisphere produces about one-third of the world's total sugar supply each year. Every American nation except Chile and Uruguay shares in the production. In the United States, three-fourths of the annual output comes from beets, which are grown in the western and north central states, and the rest from cane, grown chiefly in the southern parts of Louisiana and Florida. All of Canada's production comes from beets, while the other Americas obtain theirs almost exclusively from cane.

The Author

Mr. Burmeister is sugar specialist on the staff of the Office of Foreign Agricultural Relations. He was formerly with the Bureau of Agricultural Economics, for which he had charge of research work on sugar and prepared the annual *World Sugar Situation*.

The United States is the biggest sugar user and importer in the Hemisphere. Total production on the mainland of this country amounts to about 2 million tons a year, or about 30 percent of annual requirements. Approximately 25 percent usually comes from the two domestic offshore areas of Hawaii and Puerto Rico and another 15 percent from the Philippines. Cuba normally supplies most of the remainder, or nearly 30 percent, but small quantities are usually obtained from most of the other Latin American countries, chiefly the Dominican Republic and Peru. Canada normally meets about one-fourth of its own needs and imports the rest from Latin America, principally from Cuba.

Where Latin America's Sugar Grows

Among the Latin American countries, Bolivia, Chile, and Uruguay depend almost entirely on imported sugar. Mexico, Central America, Argentina, Brazil, Colombia, Ecuador, Paraguay, and Venezuela normally can be considered self-sufficient and do not figure in international sugar trade except in unusual seasons. This leaves Cuba, the Dominican Republic, Haiti, Peru, the British and French West Indies, British Guiana, and Surinam as principal exporters. With the exception of Cuba and Peru, most of the exports from these areas usually go to Europe, largely to the United Kingdom.

Cuba, which exports more sugar than any other country in the world and is second only to India in total production, usually sends two-thirds of its exports to the United States. Peru, another important Latin American producer, has a sizable trade with Chile and other South American countries. There is also considerable trade among the various importing and exporting areas in Latin America, the extent of it varying with changing supply-and-demand conditions within individual countries.

The sugar beet is an annually planted crop in the United States and Canada, the seed being planted in the spring and beets harvested and manufactured into sugar in the fall. Sugarcane is usually a perennial requiring 12 to 18 months to make a crop. Cane is planted in both the spring and fall months, and in many areas a single planting will yield 5 to 10 crops in as many years. The harvest of the cane usually begins in December or January in the northern Latin American countries and in June in the southern areas. The harvesting, grinding, and sugar extraction of each crop is termed a "campaign" and may continue over a period of 4 or 5 months.

Although there are several methods for extracting sugar from cane, the modern mills use the centrifugal process, which is the most efficient that science has developed and produces sugar of the highest quality. There are areas, however, that continue to use antiquated processes and produce a number of different kinds of low-grade sugars. These sugars serve their purpose adequately, however, in that they are used in the areas of production where custom and consumer preference are of prime importance.

Important byproducts of the extraction process are blackstrap molasses and bagasse, both of which are inedible. Blackstrap is used extensively in the production of industrial and fuel alcohol, for livestock feed, and in the manufacture of yeast, acetic acid, and other chemical products. Bagasse, the ground or crushed cane fiber left after the juice is extracted, serves largely as a fuel to operate the sugar mills, although some is used for making wallboard and similar products.

A relatively new sugar product is high-test molasses, used in the production of industrial alcohol. Obtained from cane from which no sugar has been extracted, it was originally manufactured as a means of disposing of surplus cane and sold at prices well below the value of the sugar it contained. Today, because of demand for alcohol in war industries, the product is of great importance.

Sugar has been in a surplus supply position in Latin America for the last 15 years largely because that area has lots of land, a climate that is favorable to growing sugarcane, and only limited areas in which to market. Production was built up during and immediately following World War I, when sugar beet areas of Europe were devastated and labor and materials were deficient. The United Kingdom, which had always imported large quantities of sugar from central Europe, turned to the Americas to supply its import requirements. During the early 1920's the Western Hemisphere countries practically fed Europe, and the increased demand for sugar from these areas resulted in high prices which stimulated expansion in production.

New Techniques and Nationalism

Another impetus given to the expansion of production was the development of new varieties of cane and of new techniques which greatly improved the efficiency of the industry. Largely because of these changes, production continued to expand even after prices took their first great downward turn in the early 1920's. This trend persisted in many areas even during the great depression period of the 1930's. Expansion was not limited to the Americas but was pronounced in many of the other important sugar-producing areas of the world.

Still another important factor that contributed to the surplus of sugar in the Americas was the wave of nationalism which swept most of the world after the war. Many countries that had formerly depended upon imported supplies of sugar were starved for the product during the war, and most of them were eager to become

Extension Service photo.

Sugar beets, after being pulled and topped, are loaded onto a truck for transportation to the factory. Beets account for three-fourths of the sugar produced in the United States and all of Canada's production.

Courtesy of Venezuelan Chamber of Commerce.

In Latin America, cane is the principal sugar-producing crop. These workmen are cutting cane with knives called *machetes.* It grows in a tangled mass and harvesting is hard work.

self-sufficient. The production of beet sugar in Europe, the United States, and Canada, and of cane sugar in other areas was boosted through increased protective tariffs, subsidy payments, quota programs, and similar government actions. As a consequence, the production of sugar in the chief importing countries increased sharply during the two decades following World War I. These increases gradually whittled down international trade in the commodity and wrought havoc in the principal exporting areas, including those of Latin America.

The Chadbourne Plan

So great was the pressure of supplies on sugar prices and on the national economy in many of the important exporting countries that steps were taken in some of these areas to relieve the situation through production control. Since these efforts were instituted by individual countries, they failed in their objective. There was no concerted action by a group of nations until 1930, when the Chadbourne plan was agreed upon and put into operation. This plan was essentially an agreement entered into by principal exporting countries to limit exports to predetermined levels through the operation of export quotas. Cuba and Peru were the Latin American signers.

At that time stocks of sugar in these areas were unusually large, and, in order to avoid the necessity of reducing production drastically in the first years of the agreement, some of these stocks were frozen. There were, however, provisions to liquidate the frozen stocks over a period of years. The agreement was to remain in operation for 5 years, and export quotas were determined for each country for each year. It was generally believed that the heavy stocks and the general level of production could be lowered gradually and that supplies of sugar eventually could be brought into balance with demand at remunerative prices.

A wrench was tossed into the machinery, however, when the principal importing countries continued to expand production behind high protective tariffs and with the aid of governmental subsidies. By the end of the fifth year the volume of international trade in sugar had shrunk to unusually low levels. Although many areas did not even attempt to export their allotted quotas, the agreement did accomplish a general reduction in production and carry-over stocks. This was a real achievement, but in the depths of the world depression sugar prices sank to record low levels, despite all that could be done to maintain them, and the Chadbourne agreement failed to accomplish its price objective.

That left American sugar in the doldrums in the early 1930's. Stocks were large, prices were low, and producers were being forced farther and farther out on an extremely insecure limb. In 1933 an effort was made in the United States to get the sugar industry to enter into a marketing agreement which would provide each supplier to the United States an equitable share of the market. After considerable negotiation among the various interests, it became evident that an agreement could not be reached.

In June 1934 the United States Congress enacted the Jones-Costigan Act, providing among other things for the limitation of sugar marketings through a quota system. While the law, of course, applied only to the United States, it affected Latin America, for quotas were assigned to all areas usually supplying sugar to the United States. The act also levied a tax on the processing of raw sugar, returns from which were to be paid to producers in the continental United States and possessions in order to effect a more equitable distribution of income.

Simultaneously, the President of the United States, upon recommendation of the Tariff Commission, issued a proclamation lowering the tariff on imports of sugar. Cuba, which since 1903 has enjoyed a tariff preference over other countries in trade with the United States, received a reduction from $2 to $1.50 per 100 pounds, raw value. On imports from other foreign areas, known as full-duty countries, the tariff was reduced from $2.50 to $1.875 per 100 pounds. The rates prevailing prior to this change had been in effect since 1930. The tariff on sugar imports from Cuba was lowered to 90 cents per 100 pounds in September 1934, when the trade agreement between Cuba and the United States went into effect. These tariff reductions, of course, did not affect the amount of sugar imported into the United States nor its price in the markets of this country, since these were regulated by quotas, but they did have the desired tendency toward making sugar exports somewhat more profitable for the countries of Latin America.

Jones-Costigan Experience

The Jones-Costigan Act not only considerably benefited United States sugar producers but had a pronounced stabilizing effect upon the industry in Cuba. The quotas adopted provided for substantially larger exports to the United States than had been moving immediately prior to the enactment of the law, and the reduction in duty, although not a part of the act, resulted in materially higher prices of sugar to producers in Cuba.

The processing tax and production control provisions of the Jones-Costigan Act were invalidated by a Supreme Court decision in 1936, but the quota provisions were not affected. The following year Congress passed the Sugar Act of 1937, which followed the general principles of the previous measure. This act has continued in effect up to the present, with minor modifications.

During the middle 1930's, while the United States and its immediate neighbors were putting their sugar house in order, world market prices continued at low levels. Hence, there was little improvement in the situation for exporting areas of Latin America other than Cuba, nor did prices rise for that portion of the Cuban supply exported to world markets. For this reason, delegates of 21 major sugar-producing and consuming countries met in London in 1937 and approved an international sugar agreement which had as its objectives the establishment and maintenance of an orderly relationship between the supply and demand for sugar in the world market, in a manner equitable to both producers and consumers. By regulating exports in accordance with import requirements in the world free market, the agreement sought to eliminate wide price fluctuations and at the same time raise world sugar prices to a level which would secure a fair return to efficient growers and producers. Brazil, Cuba, the Dominican Republic, Haiti, and Peru were the chief exporting areas of the Americas signing the agreement. The United States and Canada signed as importers. This agreement continued in force until the current war so disrupted trade that it was agreed to suspend operations. The general principles and framework of the pact are being maintained by the United Nations.

Crop Control in Latin America

Because of the great decline in the export movement of sugar from Latin America during the last decade, many countries adopted crop control programs which aimed to maintain more or less balance between supply and demand at a reasonable level of prices. Under these programs production of sugar has been held to levels that would provide for a slightly rising trend in consumption at a fairly stable level of prices.

The current war is finally affecting sugar in much the same manner as in World War I. Prices rose sharply in the fall of 1939, but declined as abruptly under the pressure of heavy marketings. In 1941, when the war spread into Russia and the Far East and shipping began to tighten, world prices started moving upward. There was a rapid increase in demand for sugar in the United States, partly because of increased purchasing power of consumers and partly because of stock building. About 8 million tons of sugar were delivered to the trade in the United States in 1941, compared with the normal deliveries of about 6.9 million tons. This increase in deliveries cut sharply into carry-over stocks of areas normally shipping to the United States and even reduced stocks in some areas which were not usual suppliers, such as Peru and the Dominican Republic. In order to take care of this enlarged demand, the United States increased quotas sufficiently to give the full-duty countries a greatly increased share in the market.

In August 1941, when a considerable rise in consumer prices of sugar was under way, the Office of Price Administration of the United States set a ceiling on raw-sugar prices at $3.50 per 100 pounds. This was slightly below the market prices then prevailing, but it was well above the 1940 average price of $2.70 and the depression low of $2.60 reached in 1932. The ceiling was raised to $3.74 in January 1942.

The Immediate Future

The United States has purchased virtually all of Cuba's 1942 crop and has revised the Cuban trade agreement to the extent of lowering the duty on sugar from 90 to 75 cents per 100 pounds. The British Government has agreed to buy the total output in the Dominican Republic and Haiti as well as that in the British West Indies and British Guiana. As a result of these actions, interest in the expansion of production of sugar in the Latin Americas is rapidly increasing. There are large land areas available, and in most countries equipment and machinery are adequate to take care of some increase.

Although the 1942 grinding season is just beginning, early indications are favorable. For the first time in many years Cuban producers have an opportunity to harvest all their cane. Mexico, some of the Central American countries, and the Dominican Republic have prospects of larger-than-normal crops. In the southern areas, where the harvesting and grinding season will not get started until June, there are possibilities of increased production in 1942 over that of recent years. This prospect applies to Argentina, Brazil, and Colombia in particular. No serious reduction in production from the level of recent years is indicated for any of the Latin American countries, and it is probable that consumption requirements will be well provided for. In fact, as a result of the recent rise in world sugar prices, many of the normally self-sufficient areas probably will have some sugar available for export.

The actual movement of these supplies depends more upon the availability of transportation facilities than anything else, for there is plenty of demand. Prospective supplies of sugar for the United States from usual sources are reduced by the isolation of the Philippines, the likelihood of a smaller crop in Hawaii, and the fact that a considerable portion of the Cuban cane crop is needed for industrial alcohol required in war industries. Thus, if ample shipping were available, the United States probably would import more sugar from Latin America, and so would the United Kingdom and Russia, both of which are rationing the product. Meanwhile, portions of the supply available are being shared among the three countries. These are some of the circumstances that have led to sugar rationing plans in the United States.

Oils of Araby

Without essential oils, produced by distillation from a variety of fragrant plants, there would be no cosmetics. The established producing areas of most of them are in the eastern world, but the Americas are taking steps to develop sources at home.

by WILBUR V. HARLAN

Essential oils are so called because they contain the essence of scent or flavor of the plants that produce them. The adjective is apt in another sense, at least so far as the feminine population is concerned, for without essential oils there would be no perfumes in the world.

Plants bearing these aromatic oils grow wild all over the world, generally in tropical and semitropical climates. Most of the essential oils used commercially, however, are produced not from wild plants but on plantations, an industry which centers in the Mediterranean basin of Europe and around the Indian Ocean in Asia. Although the manufacture of cosmetics is quite a large industry throughout the Americas, only 8 of the 75 essential oils regularly used in perfumery are produced in the Western Hemisphere, and the only one of these of prime importance is oil of petitgrain, from Paraguay.

Because of the war, the Americas face the loss of many of their former perfume oils, but this need not be too alarming to the ladies. Some of their favorite scents, particularly the costlier types, may be lacking for years, but there seems little likelihood of an acute shortage in the total supply of oils available for making perfumes, soaps, and creams. This is because the United States cosmetics industry has already developed a number of domestic substitutes for its imported raw materials and can look to Latin America for considerably increased production of essential oils from its wild plants.

In addition to its prospective role in the emergency, Latin America might well within a short time develop a true essential oils industry, based on cultivated plants. The governments of the American Republics, in cooperation with the cosmetics industry, have already taken the preliminary steps in a program designed to bring this about. Such a development would certainly be popular, for the beautiful flower markets scattered throughout Latin America attest to the people's love of flowers and their ability to produce them.

The problem of maintaining an adequate supply of essential oils is a new thing, but the use of cosmetics is as old as the world's earliest civilizations. The array of unguents and pomades buried with the illustrious dead of ancient Egypt could almost have come from your corner drugstore. There are eye shade, rouge, depilatories, nail polish, and so on, lacking only the advertised brand names to be completely modern. In the royal grave of Egyptian King Tutankhamen were found a number of alabaster jars of scented creams that were still fragrant after 3,000 years. Nor were the Egyptians of several thousand years ago the only people to develop an early cosmetic industry. The Incas in Peru had an almost equally modern and flourishing business.

It is likely that the first type of cosmetic was a form of paint similar to the war paint of the North American Indian. The first perfumes were probably prepared in the form of powders, composed of the carefully dried fragrant portions of plants. The next development was the use of fats and oils to absorb the fragrance of the various plants used. This laborious method has been practiced for thousands of years and is still in use for obtaining the finest floral scents. These two methods were not sufficient to develop a large perfume industry, however. The powders are useful as incense but unsuitable for other products, and the scented fats and oils are very expensive.

Production of perfumes as we know them today was impossible until mankind discovered distillation, for essential oils are removed from the plants in which they grow by the familiar process that produces most of the alcoholic beverages. Modern science, in fact, defines an essential oil as one that can be distilled. The curious history of distillation begins with the ancient Egyptians, who apparently developed the art to some extent and even

The Author

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Paraguay is the world's chief supplier of petitgrain oil to the cosmetics industry. Above, the leaves of bitter orange trees are taken through the forest by ox-cart to the distillery, where oil will be extracted.

Photos courtesy Fritzsche Brothers, Inc.

In operating distillery, fire is built under boiler at right, and steam is piped to tank at left, into which leaves have been packed. Distilled oil emerges from still through another pipe.

used it in the preparation of some of their cosmetics. Later the secret was lost, and not until its rediscovery by the Arabs in about the tenth century were the means available for true essential oil production. From that circumstance originated the phrase "perfumes of Araby."

During the middle ages European alchemists distilled all conceivable sorts of things in the course of what they regarded as scientific research, but they failed to notice essential oils. This occurred several centuries later, during the Renaissance, when Europe was flooded with new ideas and new substances. Aromatic plants of the whole world were available and the royal courts of the continent were intrigued by the new cosmetics offered them. Consequently, production and use of distilled oils developed rapidly, and the modern cosmetics industry was founded.

Where the Scent Comes From

The scents of aromatic plants may be contained in the flower, leaves, stalk, or even the root, and sometimes in all of them. Simplifying the chemistry involved, the odor originates in a number of volatile substances produced by the plant. If the aromatic portion of the plant is heated to the proper degree with water, these volatile elements will be distilled and may be collected. They may also be removed by soaking the plants in a solvent, such as alcohol, and then distilling the oils out of the solvent.

The resulting product, while it is called an essential oil, is not a true oil but a mixture of a number of different types of organic compounds. Each type of oil is composed of different compounds present in different amounts. In addition, oils distilled from the same plant grown in different places or collected at different stages of growth contain different amounts of the compounds. For that reason, essential oil plants must be grown under exactly the right conditions and harvested at precisely the right time to assure maximum oil production.

The amount of essential oil present in aromatic plants varies greatly. Such flowers as lavender may contain 1 or 2 percent of aromatic oil, while other plants contain fantastically small amounts. For instance, it usually takes a ton of roses to produce a pound of attar of roses. Sometimes the yield is much smaller and as much as 5 tons may be required. The yield from violets is even smaller. It takes about 15 tons of violet flowers to produce a single pound of oil of violets. Imagine picking 15 tons of violets!

The modern perfume is a true cosmopolitan. It may blend in a few drops the fragrances of tropical islands and of Alpine peaks with the incense of the desert or of foggy northern shores. Although manufacturers' formulae are closely guarded secrets, it is known that one perfume may contain from a dozen or so up to as many as 30 different ingredients. Even when it is sold under a single name, such as "rose," it will contain many other fragrant oils that will reinforce and bring out more clearly the characteristic perfume of the rose.

Not all the ingredients of perfumes are essential oils. There must always be some form of fixative and usually several are used. The fixative is a substance which absorbs the volatile oils and permits them to evaporate slowly so that their fragrance will persist for a longer period. One of the best known is ambergris, obtained from the sperm whale. Another is musk, which formerly came only from Asiatic deer and Abyssinian civet cats but now is produced synthetically and recently is said to have been extracted from the glands of the common muskrat. Most fixatives are of animal origin but a few vegetable essential oils have the same property.

There are several reasons why production of the perfume oils became concentrated in the Mediterranean basin and around the Indian Ocean. The climate is ideal and, at least in the case of the Far East, cheap labor is abundant. Perhaps the chief reason is the simple fact that the industry became centered in those areas a long time ago, and there has been no particular incentive for a change in the situation until recently.

From time to time, pioneering individuals have started plantings of a few types of essential oil-bearing plants here and there in Latin America, but none has succeeded. Paraguay uses some crude cultivation in the production of petitgrain oil, which is distilled from the leaves of the bitter orange, and a small amount of oil is obtained from limes grown under plantation conditions in various of the Latin American countries. Otherwise, the industry in the Americas is based largely on wild plants. While increased harvesting of these wild crops will undoubtedly be of value in meeting the present emergency, any permanent and efficient industry would certainly have to be based on cultivated plantings.

Domesticating Wild Plants

Certain of the wild plants of the Americas now producing essential oils could probably be domesticated. Among those that merit consideration are: bois de rose, from the forests of Brazil and the Guianas; linaloe, from southern Mexico; guaiac, from the banks of the Paraguay River; copaiba, from the Amazon and Orinoco basins; pimenta and bay from the West Indies; and the balsams known as Peru and Tolu, the first from El Salvador and the other from Colombia.

An industry based on these plants would have no direct competition for its products from other oil-producing areas, but there would be other difficulties. For anything like efficient production, high-yielding plants would have to be developed from the natural types. Since these native oil-bearing plants are trees,

this preliminary work and the subsequent launching of commercial production would take several years. Furthermore, so long as trees existed in the forest, there would likely be considerable competition with the plantations.

As an alternative to the domestication of wild plants, Latin America may well consider the possibility of adopting aromatic plants which are now producing essential oils in other parts of the world, concentrating on the 12 products which, in addition to petitgrain, account for three-fourths of the total value of all oils used in the perfume industry. These are citronella, lemongrass, geranium, lavender, vetiver, neroli, jasmine, cassie, tuberose, attar of roses, ylang-ylang, and bergamot.

Field Crops and Others

The first five mentioned can be grown as field crops and harvested in bulk, a consideration which is important in appraising prospective costs of a new enterprise. Citronella and lemongrass are at present grown in several districts around the Indian Ocean. Haying equipment is admirably suited to these crops, since the oils are derived from the leaves. In recent years geranium oil has come principally from Algeria and the Island of Réunion, while lavender comes largely from France. Both crops are bulky and can be harvested with somewhat modified haying equipment since geranium oil comes from the leaves of the plant and the entire lavender flower spike is cut. Vetiver oil comes from roots, all dug by hand by the natives of Java and Réunion, which together have supplied the world market. The crop could probably be grown and handled in bulk if some satisfactory type of digging equipment were devised. In general, the oils from this group of plants are relatively low in cost and go largely into the less expensive perfumes and soaps.

All of the remaining plants except bergamot are of the type which cannot be harvested by machinery because the oil is derived only from the individual flowers. Neroli is distilled from the flowers of the bitter orange in Italy. Jasmine, cassie, and tuberose normally originate in the flower fields of southern France; attar of roses was formerly imported from Bulgaria; and ylang-ylang is produced on the tropical islands of Madagascar, Comores, Réunion, and Nossi Bé off the east coast of Africa and on Luzon in the Philippines. Although high prices are received for these oils, much labor is involved in gathering them and successful production depends largely upon the amount of labor available and its cost.

Bergamot, like petitgrain, is a citrus product, obtained from the fruits of a type of orange which grows under cultivation almost exclusively in Italy. The plant will grow in many places in the Americas but there is no other commercial product besides the oil and it cannot be cultivated successfully in the usual commercial citrus regions where costs are high. Paraguay's petitgrain industry is successful because the oil is obtained from wild or only roughly cultivated trees. If bergamot would grow under similar conditions, the production of its oil in the Western Hemisphere would also be feasible.

Introduction of these foreign plants to the Americas seems to hold real possibilities, even though considerable preliminary work would be required if the introduced plants were to compete with the same plants in their established areas of production. Since the cost of labor in Latin America is equal to or higher than that in the countries of origin, successful operation would probably have to be based on improved technical methods. Experiments already completed show that improved methods of distillation and harvesting at the proper time can increase materially the oil yield of such plants as citronella and lemongrass.

In addition, selection of plant material for propagation could increase the yield several times. The difference would be roughly comparable to that between wild and cultivated wheat. No one would think of cultivating wild wheat but practically all of the perfume plants are in reality only wild plants collected together and tended, without much attempt to develop improved types. If the latter were done, there is no doubt that a great increase in productivity could be brought about.

While most of the plants mentioned grow best in warm or tropical areas, they vary greatly as to their moisture requirements. Some of them produce large amounts of oil only under dry sunny conditions, while others demand a moist humid climate throughout the year. For this reason preliminary tests to find the most suitable region for each would do much to assure successful cultivation.

Out of the current interest in inter-American agricultural cooperation have come a number of encouraging developments in the field of essential oil production. Lemongrass is being grown in Haiti by a development corporation recently formed for the agricultural expansion of the country. In the Dominican Republic, the colony of European refugees established at Sosúa expects to make production of essential oils one of the most important sources of its income and has already made plantings of citronella, lemongrass, and ylang-ylang. The Department of Agriculture Experiment Station in Puerto Rico has done preliminary work toward the development of high-yielding strains of several of the established oil plants and has recently made another contribution by extracting an essential oil from the coffee flower.

In general, the development of the Latin American essential oil industry is in the future, but there is every reason to regard that future as bright.

The Prodigious Brazil Nut

The life story, from tree to port to consumer, of one of the most remarkable of all the many exotic products of the Amazon Valley, with a glance into the future of the almost entirely Brazilian industry of which it is the basis.

by WALTER R. SCHREIBER

History is regrettably vague about the details of the discovery that the Brazil nut was good to eat, but it does record that the doughty Dutch, early traders in the Amazon Valley, were exporting the nut to their native land under the name of "wild oil fruit" as early as 1633.

According to the best accounts, the Brazil nut was used largely as a livestock feed until about 1800, when it became recognized as a table delicacy. Demand increased and in 1866, when the Amazon was opened up to foreign commerce, the Brazil nut became one of the chief exports. To this day, the nut is produced only in South America and almost entirely within Brazil. There have been several attempts to introduce it into the eastern tropics, but all have failed.

The Brazil nut tree is something of a prodigy, even by the standards of Amazonia, where exotic vegetation is the rule. It is so tall that the nuts can scarcely be seen while growing and can be harvested only after they fall to the ground. Nuts form inside a heavy spherical pod that plummets earthward with all the potential destructiveness of a cannonball. These pods can be opened only with great difficulty and the nuts, once removed, are among the hardest to crack of all the sorts in commercial use.

Despite the difficulties of penetrating this natural protection, the Brazil nut is among the low-priced nut crops, because much of the work is done by jungle dwellers. This fact and its rich blandness of taste have contributed to wide popularity, and annual world consumption runs in the neighborhood of 45,000 tons a year. Before the present war, Europe was the biggest buyer, importing the nuts both for use and for shelling and reexport. In 1940 and 1941, however, Europe imported no Brazil nuts at all, and the United States became the chief market.

In most years the Brazil nut is imported into the United States in larger quantities than any other foreign nut except the cashew and is surpassed in use among domestic nut crops only by the walnut and the pecan. For many years there was an import duty of 1½ cents a pound on unshelled nuts and of 4½ cents on shelled. Under the 1936 trade agreement with Brazil, these duties were cut in half. This appears to have had little effect on imports of unshelled nuts, but imports of shelled nuts have increased steadily in recent years.

Brazil-nut trees are found growing wild, usually in groups of five or six and sometimes in fair-sized groves, throughout the Amazon Valley. Harvesting of the nuts occurs chiefly in the Brazilian portion of the valley, a sparsely populated area of more than a million square miles, where the temperature is uniform and rainfall is from 65 to 85 inches a year. It is estimated that nuts are harvested from at least 100,000 trees every year, and there must be hundreds of thousands of trees that are never touched. With the wild product so abundant, little has been done in the way of plantation cultivation. There are two small plantations in the basin, both of them too young to be appraised for economic soundness.

The tree is one of the largest in Amazonia, reaching a height of from 75 to 100 feet and usually towering above the surrounding jungle. The smooth trunk is from 4 to 6 feet in diameter and rises bare as a flagpole, without lower branches, to a crown of dark green leaves that often spreads out to a diameter of 100 feet. The wood is clear-grained and gray in color and the tree would make good saw timber if it were not more valuable for nut production. The bark is used in the manufacture of oakum and a coarse cloth used by natives of the area.

The Author

Mr. Schreiber is a member of the staff of the Office of Foreign Agricultural Relations. This article is an abstract of his longer study, "The Amazon Basin Brazil Nut Industry," which has just been published by the Department of Agriculture as No. 4 in its new series of Foreign Agriculture Reports. The author obtained his information on a trip to Brazil in the winter of 1940–41.

This is the towering Brazil-nut tree. Arrow indicates man standing at base.

Unshelled Brazil nuts in storage on docks in New York City. The United States also imports them in shelled form.

This tree bears as fruit a large, woody-shelled capsule, closely resembling the husked coconut seen in North American markets. This is dark brown and from 4 to 6 inches in diameter and is called an *ouriço*. The brown husk shells off to reveal a hard pod of a woody substance that, when cut and polished, contains a grain similar to that of bird's-eye maple. The pod is about a fourth of an inch thick, and each one contains from 12 to 20 Brazil nuts, which grow like the sections of an orange and are held in place by a fiber which dries as the pod matures and shatters when it falls to the ground.

The tree is a moderately fast grower but even so takes a long time to reach full maturity. It is propagated by the small nuts within the pods, sprouts within 30 to 90 days, grows about a foot in the first year and is 15 to 20 feet high at 5 years. At that time it begins to produce cream or white flowers, which grow in clusters and somewhat resemble the ornamental hydrangeas of the United States. Then it fights its way somewhat more slowly up through the jungle and in its twelfth to fifteenth year begins to bear fruit. Since about a year elapses between the blossom state and the time when the pods drop to the ground, a producing tree bears both blossoms and mature fruit at the same time. Pollenization appears to be done by insects flying from one tree to another.

In its lofty perch, the Brazil nut is practically free of disease or insect damage, so far as can be learned. Some pods crack and admit rain and air, thus causing the nuts to mold. No one knows just what causes the cracking, however, since the nuts cannot be examined while growing. There is little variation in yield from year to year, and the size of the crop is determined almost entirely by whether or not the price is high enough to appeal to the jungle workers who gather the nuts. If it is not, the nuts are simply left lying on the ground to rot, for the dampness and heat of the region make it impossible to store even 1 year's production in the jungle for disposal the following year. When nuts are left in the jungle, the trade refers to them as "abandoned," and the word is used literally.

These jungle folk whose word is final regarding the size of the world's Brazil nut crop are called *caboclos*, or copper-colored ones, a name that originated in the days when practically all residents of the Brazilian interior were Indians. They harvest all of the many wild crops of the Amazon and, when engaged in gathering Brazil nuts, or *castanhas*, are called *castanheiros*.

The *caboclo* usually lives with his family in a hut of some sort, built at the edge of a river or creek, and has a small plot of ground. There he plants mandioca, rice, and bananas if he has the cleared land and the inclination. He may also have a few pigs, goats, or even cows, although wild animals and snakes are a constant menace to livestock. He fishes and hunts a little and obtains

everything else he needs from the nearest trading post in exchange for forest products.

Paths Through the Jungle

Radiating from each *caboclo's* clearing are several paths, or *estradas,* which have been carved through the jungle from one productive tree to another. A typical *estrada* may have on its course Brazil nut, rubber, tonka bean, and even other trees. It may wind across small streams, swamps, and fallen logs, and there is an almost constant struggle between the jungle and the *caboclo* in his attempt to keep the *estrada* open.

Added to normal jungle hazards in harvesting Brazil nuts is the danger from falling pods, which weigh from 2 to 4 pounds each and fall at the rate of from 800 to 1,000 feet a minute. If a laborer is hit by one, he may be seriously injured or even killed, so little work is done on windy or rainy days when pods tend to fall. Even on calm days, the workers are constantly on guard against falling *ouriços.*

Otherwise, the harvesting is simple. The *caboclo* and possibly the members of his family follow the *estrada* to the tree or trees. They collect the pods in baskets or throw them out from under the trees and collect them later. The pods are then carried to the camp where they are cut open with a *terçado,* a long knife similar to a sugarcane knife and one of the prized possessions of all *caboclos.*

The task of cutting open the pods is usually reserved for days on which it is dangerous to be under the trees. Sometimes, however, the other members of the *castanheiro's* family do this part of the work. The nuts are put into a basket or on mats on the ground until a sufficient quantity has been collected to deliver to the local trading post.

Whether the land on which the trees are found is publicly or privately owned makes little difference to the *caboclo.* If the land belongs to an individual, all products must be delivered to the trading post (*barração*) of the owner. If the land is publicly owned, the *caboclo* may collect nuts and other products without payment of taxes and sell it at any of the trading posts, which are scattered a few miles apart throughout the more developed areas of the Amazon Valley. In either event, he transports his goods on his back or by canoe to the post, and receives his pay at the current market rate in such items as hardware, matches, cotton cloth, mandioca flour, dried beef, and sugar. In the course of a season, his purchases just about use up all he has earned, and rare is the *caboclo* who has a cash balance coming at the end of the year.

There are hundreds of trading posts in the Amazon Basin, all sending their Brazil nuts and other commodities by water to the export centers, Belém and Manaus, for sale through brokers to exporters or shellers. From those ports, the nuts move into international trade.

Brazil nuts were once exported entirely in unshelled form, and all the shelling was done in Europe. World War I disrupted this practice, however, and in 1926 a group of energetic Brazilians started a domestic shelling industry. Now there are eight plants in Belém, five in Manaos, and two in Acre. There are also two in Bolivia, which produce small quantities for export through Brazilian ports.

By 1931, all imports of shelled Brazil nuts into the United States were coming directly from Brazil, and there have been no imports from Europe since. In 1940, Brazil's exports of shelled nuts amounted to more than 7,000 tons, almost equal to the volume of its unshelled shipments when allowance is made for the shells removed. Brazil naturally prefers to export shelled nuts, since this provides domestic employment and brings more foreign exchange into the country.

Shelling in the more modern of the factories is in sharp contrast to ordinary household methods, in which a brick and hammer are the key instruments. Results are correspondingly better. First the nuts are soaked in water for 24 hours, then they are placed in boiling water for from 3 to 5 minutes. Thus prepared, they are cracked in a hand-operated machine a good deal like the home bottle capper used in the United States. Care is taken to avoid damaging the kernel. The girls who do this work are paid on a piecework basis and the speed of some of them is amazing.

The Industry Today

The Europeans who dominated the Brazil nut business for years have for the most part dropped out, and today it is operated almost entirely by Brazilians. The industry, with what amounts to an unlimited supply, is eager for expansion, which under present circumstances can only result from an increased market in the United States. To develop this, an intensive advertising campaign has been carried on through the Brazil Nut Advertizing Fund to acquaint United States confectioners with the uses of shelled Brazil nuts.

Through the middle of 1941, it appears that increased United States purchases about compensated for the loss of European markets. What the immediate future may bring is difficult to predict. To some extent, Brazils can substitute in the confectionery trade for cashews, which came from India before the war. There are undoubtedly many products of the Amazon Basin which are more essential to the United States in wartime than are Brazil nuts. Thus the industry is likely to be greatly affected by the shipping situation. It can only bide its time and hope for the best, which is what the *caboclos* back in the jungle have been doing for centuries.

Summer School at San Marcos

Classwork is not everything at a winter-time "summer" session of Peru's famous university, the oldest in the Western Hemisphere. There is also time enough to learn a little about the people of the country and how they make a living from their land.

by ANNIE M. HANNAY

Three hundred and ninety-one years is a long time in the life of a university—time enough to add the vigor of a new era to the charm of antiquity. The University of San Marcos in Lima, Peru, founded in 1551, wears ancient attire but its ideas are as modern as the electric eye. Evidence of this is its Summer School, which annually brings students to Peru from all over the United States. As one of a group of 93 North Americans who attended the 1941 session, I found the experience exciting and memorable. Four weeks as a student and 2 weeks more of just plain *turismo* constituted a real adventure in good neighborliness.

San Marcos (officially La Universidad Nacional Mayor de San Marcos) is the oldest university in the Western Hemisphere, almost a century older than North America's Harvard. Although originally established in a Dominican monastery by royal decree of King Charles V of Spain, the school was soon made a separate entity and its name was chosen by popular vote. Ever since, it has been relatively free of religious and political intervention.

Until the present century, San Marcos drifted in leisurely fashion without much adjustment to the changes taking place outside its ancient arches. In 1918, the university reform movement, which began in Argentina and swept upward through Latin America to Mexico and Cuba, stirred San Marcos from its languor. The students wanted new professors with modern ideas. They wanted a new pattern of university life. More, they demanded representation on the administrative body of the university, a request which was regarded as something revolutionary.

A National Student Congress was held in Cuzco in 1920. The demands sponsored by the delegates were peremptorily rejected and all the Peruvian universities were closed. Two years later a compromise was effected between faculty and students. A subsequent reform attempt in 1931, bitter with political agitation, resulted in suspension of classes for 4 years. Now the University's portals are open again; the faculty has been reorganized; teaching methods have been revised; and, although a university statute prohibits participation in politics, a mediaeval university has developed into a modern institution of learning.

These changes have not affected the old-world flavor that makes San Marcos one of the most delightful universities in the world. The buildings, situated in one of the older parts of Lima, are not prepossessing. Classrooms are neither well lighted nor well ventilated, but the school has the glamor of age and the attraction of pillared cloisters and patios lavish with flowers, palms, and fountains.

Our group traveled to Peru under arrangements provided by the University and other Peruvian organizations, together with the International Institute of Education in New York and the Grace Line. Sailing from the warmth of mid-June New York and through the humid tropics, we arrived in Lima in late June to find the weather distinctly chilly, since the special session, while officially called a "summer" school, is held in the midst of the Peruvian winter season.

We were welcomed cordially at an opening meeting in the convention hall of the University. A reception followed in the Rector's office, where North and South saluted each other with a champagne toast in traditional Peruvian fashion. Summer students were offered courses in literature, history, history of art, archaeology, diplomatic relations, economic geography, constitutional law, Spanish, and even Quechua language and folklore. Some serious work was done, and the certificates awarded at the end of the 4-week period were usually well earned. The purely academic aspect of the session was not overstressed, however. There were no classes on Saturday, and ample time was provided for social contacts and for carefully planned field trips, through which the pattern

The Author

Mrs. Hannay is on the staff of the library of the Bureau of Agricultural Economics, Department of Agriculture. The visit to Peru described in this article was her third to South America, earlier trips having taken her to practically every country on that continent.

Prof. Julio Tello of the University lectures to a summer school archaeology class while on a field trip.

Courtesy Frances M. Burlingame.

One of the flower-bedecked patios at the University of San Marcos.

of the civilization of Peru was reconstructed for us.

There were visits to Cuzco, the old Inca capital, famous for its ruins of fortresses and temples; to Arequipa, sprawling at the foot of Mount Misti; and to various other archaeological excavations under the guidance of Dr. Julio Tello, Peru's foremost archaeologist, and his staff. Nor did we concentrate exclusively on archaeological Indians and ancient civilizations. We found no less interesting and much more colorful the Indians of today. They are seen at Pisac or Huancayo of a Sunday garbed in their brilliant native costumes, attending mass, or selling their wares. And if perchance the head of the house drinks a little too much *chicha,* his patient wife is on hand to lead him home on foot, often a distance of 4 or 5 miles. Among Peruvian Indians, it is the wife who runs the home, takes charge of what money there may be, rears the children, spins, weaves, dyes, cooks, and even works in the fields.

Among the Indians of the Andes, agriculture is still primitive, consisting for the most part of subsistence farming on terraces or *andenes* rising 1,000 feet above the valleys, just as in Inca and pre-Inca days. Such crops as corn, beans, potatoes, and wheat are cultivated, and in the higher regions, even up to 11,000 or 12,000 feet, we saw quinua, a grain said to have a greater nutritive value than either corn or wheat. Nothing is wasted in this native cereal. The leaves are used to flavor soups and stews and the grain is used as gruel or, when ground, to make biscuits or bread.

Most of Peru's commercial farming is done in an area from 50 to 60 miles wide along the Pacific coast, with cotton and sugar as the chief money crops. Of approximately 400,000 people engaged in farming, 80,000 are occupied in raising cotton and 30,000 in growing sugarcane. As in the United States, cotton is cultivated largely under a sharecropping system—known locally as *yanaconaje.* The haciendas are divided into plots which are worked by the tenants, the owners providing capital and tools. Under a contract reminiscent of the days when Peru was a colony of Spain, the crop is sold to the owner at less than the market price.

Most of the cotton is of long-staple varieties for which various European nations have long been the best customers. The closing of Europe as a market was a severe blow to cotton growers, and supplies piled up until Japan began to buy Peruvian cotton a year or so ago. The first thing our party saw on arrival at the port of Callao was a Japanese freighter loading cotton. This is a scene that visitors do not see today, for Peru was one of the first of the American republics to sever economic and political ties with the Axis in accordance with a resolution of the Rio de Janeiro conference.

While numerous streams cross this coastal area, there is very little rain, and it is estimated that at least half the country's agricultural production requires irrigation. We drove for miles along the Pan American Highway north of Lima and saw nothing but sand dunes, dotted with prehistoric skulls and bones exposed in the process of excavation. On the other hand, in the Province of Ica, to the south of Lima, irrigation is extensive and there are thousands of acres producing fruit, especially grapes and oranges, which we had been buying from Indian vendors in the streets of Lima.

By station wagon we traveled over the highest paved road in the world, past copper, silver, and vanadium mines (mining is second to agriculture as a source of Peruvian wealth) and down into the *montaña,* or jungle, the land of coffee, bananas, papaya, and avocado, of the boa constrictor and the jaguar, of the orchid and the wild vanilla plant. It is an area of almost limitless possibilities as a source of rubber, hardwoods, and a variety of other tropical crops needed in the United States. Many of its riches grow wild and there are thousands of acres available for cultivation under ideal conditions of tropical soil and moisture. Prospects are bright for the future of the jungle of Peru.

All of us were as pleased as we expected to be by the pastoral calm of the llamas, the alpacas, and the vicuñas, those camel-like creatures without which Peru would not be Peru. The llamas, most picturesque of all, are used chiefly to carry loads, but not too heavy loads, or, like Robert Louis Stevenson's donkey, they will lie down, eye you haughtily, and refuse to budge. Alpacas and vicuñas provide fur which goes into the excellent rugs and woolen goods of Peru.

In addition to rugs, we found beautifully wrought silver and other objects of native artistry in the shops of

H. Hinrichs photo.

Pack-laden llamas, the picturesque beasts of burden of the Peruvian Andes.

Peru. There is a special fascination in wandering about the narrow streets of Lima, the City of Kings, where houses are flush with the sidewalk and overhanging balconies suggest bygone romances. In the moonlight, patios that once belonged to fine homes recapture some of their old allure. Plazas, broad avenues, and the lawns of suburban bungalows are alive with bougainvillea, copa de oro, and hibiscus.

Over all is the unforgettable courtesy of the Peruvians, who were tolerant of faltering Spanish and, when a member of our group asked for "postcardes de camels," did not laugh but cheerfully produced llama postcards. The cards, incidentally, were quickly dispatched to friends in the States with the usual "having a wonderful time" plus the suggestion that they get acquainted with Peru the San Marcos way.

Reading
ABOUT THE AMERICAS

Una Nueva Argentina, Alejandro E. Bunge; 513 pp., bibliography, Editorial Guillermo Kraft, Ltda., Buenos Aires, 1940. Deals with population problems, economics, politics, defense. Graphs and tables.

A History of Chile, Luis Goldames (translated by Isaac Joslin Cox); 565 pp., The University of North Carolina Press, Chapel Hill, N. C., 1941. Scholarly work by an outstanding Chilean historian. Biographical and bibliographical notes.

Guatemala Art Crafts, Pedro de Lemos; 40 pp., The Davis Press, Inc., Worcester, Mass., 1941. Beautiful pictures illustrating crafts, architecture, musical instruments, people.

Reportage on Mexico, Virginia Prewett; 322 pp., E. P. Dutton & Co., Inc., New York, 1941. Discusses political and social forces from Colonial times to present day.

The Monroe Doctrine, Richard K. Showman and Lyman S. Judson; 302 pp., bibliography, H. W. Wilson Co., New York, 1941. A compilation of public statements pro and con, economic implications, and future possibilities.

Latin America as a Source of Strategic and Other Essential Materials, U. S. Tariff Commission (Report No. 144, Second Series), 397 pp., Washington, D. C., 1941. Mineral, agricultural, pastoral, and forest products are covered.

ALONG THE *Agricultural Front*

▲ Secretary Wickard Defines Farmers' Wartime Task

Agriculture's task in wartime, in the words of Secretary of Agriculture Claude R. Wickard of the United States, is to "turn out exactly what our Nation and our allies need in the way of farm products, at the time they are needed." The task of Federal agricultural workers, he says, is to help them do this and to see that "most effective use is made of these products."

▲ Soil Conservation Law Enacted in Colombia

A new law passed by the Congress of Colombia provides for the creation of a soil conservation service in the Ministry of National Economy to organize laboratories for soil analysis. It also authorizes the Ministry of National Education to establish vocational schools of agriculture and industry.

▲ Chile to Stem Desert With Trees

A planned expenditure of 25 million pesos has been announced by Leoncio Chaparro, President of the Agricultural Colonization Bank of Chile, to bisect the northern part of that country with a forestal barrier to the great Atacama Desert, which has been moving southward toward the central, populated area at the rate of one kilometer a year. Within a little more than a century a few patches of stubble for wild goats has replaced the forests which the Spaniards found when they came down from Peru.

The Bank is confident that the barrier, when developed and supplemented by an indigenous association of shrubs, grass, and a variety of semitropical flora, will form a "defense in depth" and bring rain to make the desert recede.

▲ Cuban Law Requires Diversified Farming

In order to encourage the diversification of farming, the Cuban Government has enacted a decree-law providing that operators of large sugar farms must divert part of their land from sugarcane to rice, corn, peanuts, beans, and other food crops. The law applies to operators of farms larger than five caballerías (about 165 acres). Cattlemen may raise hogs instead of growing food crops.

The Cuban Ministry of Agriculture will help in meeting expenses of the plan by supplying part of the needed seed, agricultural machinery, implements, and insecticides.

▲ Panama Opens New School of Agriculture

A new School of Agriculture and Government Experiment Station has opened in Panama under the direction of Dr. Manalco Solís, a graduate of Cornell University. It will have a 3-year course of training designed primarily to give farm boys training in agricultural practices and the handling and care of livestock.

Students must be sons of farmers, have completed the sixth grade, and be not less than 15 years of age. The school has an enrollment capacity of 100, but the number actually accepted so far is 40 students, most of whom enrolled under scholarships granted by the Panama Government.

▲ Peru Issues Pamphlet on Rubber Production

To familiarize prospective plantation rubber producers in Peru with modern tapping methods, the Ministerio de Fomento of that country recently issued a pamphlet, entitled "La Explotación Racional de los Arboles de Heveas" (Proper Tapping of Rubber Trees), for distribution in areas where rubber is being encouraged.

The booklet, illustrated with photographs and drawings, was written by Manuel Sánchez del Aguila, Peruvian government engineer in charge of activities under the cooperative rubber production project.

●

A new agricultural school has been opened in Caracas, Venezuela, by the religious order of the Salesianos.

AGRICULTURE IN THE AMERICAS — ROBERT H. INGRAM, EDITOR

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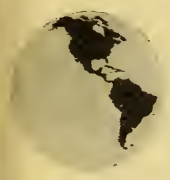
Celso R. Velázquez

OUR MUTUAL FRIEND



Wartime multiplies the official duties of those who represent their native lands in international affairs. Particularly is this true today among the American nations, now that the Western Hemisphere is under attack.

That is one of the important reasons why arrangements were made not long ago to raise to embassy rank the United States legations in Bolivia, Ecuador, and Paraguay, the only countries of South America where they did not already have that status. The same change was made in the rank of the legations in Washington of the three countries..

As a result of this action, the inter-American diplomatic family in Washington has gained as its newest member Dr. Celso R. Velázquez. He is the first Ambassador to the United States from Paraguay, the little Republic on the La Plata River whose million inhabitants live by exporting livestock and forest products and enjoy an enviable reputation for vigor, fortitude, and patriotism.

Not only is Dr. Velázquez Paraguay's first Ambassador to this country, but the appointment marks his first appearance on the international scene as a diplomatic representative of his country. On the basis of his record in public affairs in his homeland, he is well qualified for the new role.

At the time of his appointment the new Ambassador was serving as Rector of the University of Paraguay in Asunción, where he received his own education in law and had previously served as dean of the law faculty. He has also been professor of law and social sciences in various other institutions.

A native of Asunción, Dr. Velázquez enjoyed a successful law practice there before entering upon a public career in the judiciary branch of government. He became a judge in the primary court, later was named judge of the court of appeals, and also served as a judge of military tribunals with the rank of major.

In the field of national government, he has been Undersecretary of the Treasury and a member of the Council of State, which serves the President in an advisory capacity.

Dr. Velázquez is known as a firm believer in the solidarity of the Americas. Intelligent and energetic, he should make important diplomatic contributions to that cause.

Ports of Middle America

Like the South American cities described on this page last month, the ports of Middle America are commercial centers of their countries. Their exports are for the most part tropical agricultural products, plus some minerals, while their imports include both manufactures and temperate zone farm products. To a large extent, their commerce is with the United States, which has long been the principal market for the Central American countries.

Along the Gulf of Mexico, south of New Orleans, the first large port is Tampico, chief commercial outlet for northern Mexico and that country's principal port for petroleum exports. Veracruz, 2,000 nautical miles from New York, is the port of entry for most of southern Mexico and is joined by rail with almost every important center in the country.

Guatemala's ports are Puerto Barrios on the Atlantic Coast, receiving three-fourths of the import trade, and Champerico, an open roadstead on the Pacific, which vies with its Atlantic rival for leadership in the export of coffee.

The banana ports of Honduras are confined to its Atlantic coast. Largest of these is Puerto Cortés, 3 days' steam from New Orleans. Trujillo, formerly the largest trade center on the Atlantic in all Central America, now trails Tela and La Ceiba in banana exports. Traffic to the capital, Tegucigalpa, enters through Amapala on the Pacific Coast.

La Libertad is El Salvador's chief passenger port. Because of its proximity to San Salvador, capital of the Republic, there is a fortnightly steamer service. Bluefields, named for a Dutch pirate, is Nicaragua's Atlantic export center.

Built on the ancient Indian village where Columbus landed on his last voyage to America is the busy port of Limón, through which pass Costa Rica's coffee and bananas en route to North American and European markets. There was a time when Puntarenas, Costa Rica's Pacific port, handled most of the country's foreign commerce, but now it concentrates on imports.

Gateway cities between the Atlantic and Pacific are Panama City and Colón in the Republic of Panama. Once rendezvous for international desperadoes, they are today thriving cities that blend old-world atmosphere and the bustle that surrounds the greatest of man-made waterways, the Panama Canal.

In the three West Indies Republics, the leading ports are also the national capitals—Havana in Cuba, Ciudad Trujillo in the Dominican Republic, and Port-au-Prince in Haiti.

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IN THIS ISSUE

May 1942

NAMES & NEWS

The Rubber War

American forces of rubber production are striking back at the threat of a critical shortage in the Western Hemisphere, just as its military forces are counter-attacking the Axis all over the world.

Latest move in the campaign is the departure for Latin America of 16 technicians employed under a previously announced project of the Technical Advisory Service of the Office of Inter-American Affairs. Experienced and fully armed with the latest knowledge about the extraction of rubber from wild Hevea and Castilla trees, these men have reached their stations in a number of jungle areas of tropical America, where they are taking the first steps toward increased production of rubber from wild trees. The men, with their assignments and experience, are:

Brazil: *Harold E. Gustin, Wallace E. Manis, Homer Pease, Michael A. Polli,* and *Bruce B. Worth,* all of whom have been employed as technicians on African rubber plantations; *H. M. Rinehart,* veteran Amazon Valley explorer; and *Paul B. Warner,* former Brazilian representative of a United States rubber firm.

Bolivia: *M. A. Cheek,* erstwhile rubber buyer at Singapore; and *Harvey R. Frantz,* previously engaged as a rubber planter in West Africa.

Colombia: *Marshall G. Carlton* and *R. S. Pocklington,* both veterans of rubber production ventures in Liberia.

Mexico and Central America: *Carl D. Kennedy,* former rubber explorer in Mexico and South America; and *George L. Seeley,* specialist in export sales of rubber manufactures to Latin America.

Peru: *Raymond Russell,* former technician on rubber plantations in Liberia.

Venezuela: *Robert J. Hines,* previously in charge of shops and transportation on Liberian plantations.

To encourage greater production of rubber from the wild guayule shrub in Mexico, *O. D. Hargis,* a veteran in the field of tropical agriculture, has been assigned to that country.

The entire group is under the direction of *C. B. Manifold,* on assignment to the project from the Department of Agriculture.

The supporting corps that will actually purchase or at least finance the purchase of wild rubber, basing its activities on reports of the scouting force, is still in the early stages of development. Involved in this phase of the campaign is the Rubber Reserve Company, U. S. Government-owned financing and stockpile-building agency, which has already agreed to establish a $5,000,000 fund for raw rubber development in Brazil and to purchase that country's output for a period of 5 years.

There is equally feverish activity on another section of the front, where the scientific army has just moved into the front lines with its program for expanded acreage of the cultivated guayule shrub in the western United States and in Latin America. This is described in some detail in the article, "Go Ahead, Guayule!" beginning on the facing page.

In the front line, too, are the battalions of the Department of Agriculture's long-range program to develop plantation rubber culture in the Western Hemisphere. So far as actual rubber production is concerned, this project may have

(Continued on page 100)

Agriculture IN THE *Americas*

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Go Ahead, Guayule!

Seeking an emergency source of rubber, the United Nations turn to a promising desert shrub of the Americas, and the Department of Agriculture launches an "all-out" program in the United States and Latin America for a speedy increase in production.

by E. W. BRANDES

In time of national emergency, the lowly desert shrub, guayule, is coming into its own as a source of rubber. After years in the shadow of its more renowned competitor, the Hevea rubber tree, guayule got the green light March 5, 1942, when President Roosevelt signed a bill authorizing a government program to develop the shrub as one means of relieving the rubber shortage of the United Nations.

Specifically, the bill provides for the government to take over the small existing cultivated guayule industry in California and expand present plantings to 75,000 acres as soon as possible. It also authorizes test plantings to determine suitable guayule production areas anywhere in the Western Hemisphere, the President having vetoed an earlier measure which confined experiments to the United States.

The Department of Agriculture, designated in the Act as the federal agency in charge of the work, lost no time in undertaking the program. At the time the Act was signed, an agreement had already been reached for purchase of the holdings of the Intercontinental Rubber Company, which for more than 30 years has been producing small amounts of rubber from guayule. This transaction was immediately completed. Within a week, Secretary of Agriculture Wickard announced the Department's program and sent representatives to the field to hasten preparations for the 1942 spring planting season. As an indication of the size of operations, one of the first activities was to begin installation of 85 miles of perforated pipe for overhead irrigation of a 500-acre plant nursery.

In turning to guayule as a source of the most urgently needed of raw materials, the Western Hemisphere has given the nod to a native American plant which normally accounts for less than 1 percent of United States rubber imports each year. Practically all production has been from wild plants in Mexico. There has been some experimental cultivation, but the industry has been kept small by the competition of lower cost Hevea rubber from Malaya and the Dutch East Indies, which ordinarily produce about 97 percent of the total world rubber supply. Cultivation, however, is the essence of the present resort to guayule as a timely source of rubber. By cultivation, the life cycle of the normally slow-growing plant may be telescoped so that growth which would require 5 to 20 years in the desert is attained in from 2 to 4 years.

Guayule, known botanically as *Parthenium argentatum,* is a stubby, widely branching, woody shrub, seldom more than 30 inches tall, with small silvery leaves that

The Author

Dr. Brandes, a veteran Department of Agriculture plant scientist, has been in charge of the Bureau of Plant Industry's Division of Rubber Plant Investigations since it was established in 1940 to direct the program to develop plantation rubber culture in Latin America. His article, "Rubber on the Rebound—East to West," appeared in the April 1941 issue of *Agriculture in the Americas.*

give the plant a dusty appearance. It is found growing wild on limestone slopes over an area of roughly 20,000 square miles in the dry tableland of north central Mexico and adjacent Texas, where there is from 9 to 15 inches of rainfall a year and summers are long, hot, and dry.

Rubber is stored in all parts of the plant except the leaves and may amount to as much as 22 percent of the dry weight of the wild shrub although the average is about 7 percent. Some rubber accumulates in the first year, and the percentage increases for about 7 years. Plants are usually ready for harvesting at the end of the fourth year. If not harvested, a plant may continue to live for 40 or 50 years.

The Indians Knew Guayule Rubber

The North American Indians discovered the presence in guayule of the elastic substance that was later to bring it into prominence. How they made the discovery is a mystery. A slice of the stem must be chewed for a good 20 minutes before there is any hint that a homogeneous material is being separated. The taste is not pleasant, but neither is it nauseating and it does have a pleasing and freshening effect on the mouth. Even so, there seems little reason why the Indians should have chewed it, unless the idea was suggested to them by rodents, which occasionally browse on guayule. In any event, they did discover the rubber, which they used to make bouncing balls for their games.

The first experimenters with guayule were the Germans, who before 1900 were extracting rubber from supplies of the wild shrub shipped from the Western Hemisphere. The business was not really established, however, until about 1904 when a practical method of extraction was perfected by the Intercontinental Rubber Company. In that year the first factory was established in Torreón, Mexico, with a capacity of 1,000,000 pounds of wet rubber a month. A little later factories were built at Cedros and Catorce, Mexico, and small-scale production has been almost continuous since, except for a short period of abnormally low prices in the early 1930's. An extraction factory was also operated in Marathon, Tex., for a few years until the supply of the wild shrub became inadequate. The present United States industry is in central California in the Salinas River Valley, which is perhaps better known for production of sugar beets and lettuce.

At the beginning of the century, it was estimated that supplies of wild guayule would not last more than 17 years. This life expectancy was prolonged when the users of guayule wisely recognized the situation and began to harvest only mature shrubs. In recent years, the Mexican government has controlled the collection of the shrub by requiring permits, issued through the Forestry Department, and fixing the minimum size plant that may be taken. As a result of these measures, it is now estimated that a constant production of from 7,000 to 10,000 short tons of guayule rubber is possible annually in Mexico without depleting the natural supplies.

This tonnage is, of course, only a drop in the bucket of Western Hemisphere rubber needs, and any larger contribution in the emergency will depend on cultivation of domesticated plants. This is not simple, for guayule, like many of the weeds that grow in waste places and appear to thrive anywhere, is difficult to cultivate. Fortunately, a great deal of the spadework has already been done. The Intercontinental Rubber Company has developed strains of guayule with a rubber content more than twice that of wild plants. This increase has been paralleled by advances in methods of cultivation, the development of special planting machinery, and improved processes for extracting the rubber. Through these developments the groundwork has been laid for the program which will now be carried on under government auspices.

While the old cowboys of the western range say that guayule thrives on "rotten land," or limestone rock covered with very little soil, indications are that good crop land is most suitable to commercial production. It is a mistake, however, to jump to hasty conclusions as to the suitability of any area for the plant. Assertions have been made that the plant can be successfully cultivated in humid areas such as the Gulf States, or in the midwest up to the Canadian border. Such statements are based on unreliable information and are not correct. From reasonably well-established facts, it appears that the guayule plant will not grow well and produce rubber east of the meridian of Corpus Christi, Tex., or north of San Francisco. The best areas within this region are being selected through the results of extensive test plantings of the shrub.

The Fallacy of Broadcast Seeding

Another fallacious idea that has become prevalent is that guayule seed should be broadcast in the desert to create a reserve of the wild plant for future use. The fallacy is that even in its natural range guayule cannot survive the aggressive competition of other desert plants except in narrowly circumscribed areas having special conditions of soil, topography, and climate. In the area to which it is native, for instance, solid stands are seldom seen and one may travel 20 to 30 miles without sighting a single shrub. Shotgun methods of seeding are not likely to locate the conditions required for survival and growth under natural conditions.

The seed on which guayule cultivation is based are so small that a pound contains around 600,000 seed envelopes, less than 10 percent of which contain fully developed seeds. They are difficult to handle because

Wild guayule shrub, mixed with other plants, on a ranch in Texas. The small, bushy plants are guayule.

Bureau of Plant Industry photos.

Under cultivation, the plant looks much different. These are 5-year-old cultivated plants in California.

their tendency is to refuse to be regimented into germinating and developing in unison. Seed production is intermittent but it is abundant following showers of rain or the application of irrigation water in the period from June to September. Seeds are usually collected from cultivated fields during the spring or summer with a suction picker, designed like a large vacuum cleaner, mounted on a tractor.

As developed in the Salinas Valley, the cultivation of guayule is a highly developed agricultural process utilizing "moving-belt" methods. Presprouted seed are planted thickly on nursery beds and covered with a thin layer of sand. Eight to 12 months later the whole nursery bed is uprooted by a tractor-drawn bar which cuts the roots off about 8 inches below the surface. The plants are then transplanted to the field, using a planter which permits planting six rows at a time. They are cultivated like corn, four times the first year, three times the second and third years, and twice the fourth year. Except for certain seedling diseases and root decay in some areas, the plant appears to be rather resistant to insect and disease enemies.

Harvesting is confined to the so-called dormant period, following the long dry summer, when the rubber content of the plant is greatest. At harvest the plants are plowed up, windrowed, gathered, and shredded by special equipment in the field. They are then ready to be taken to the factory for extraction of rubber.

In the factory, the rubber is obtained by an ingenious mechanical process, in which the shredded plants are crushed and run through revolving tubes where water and heavy flint stones macerate the fiber. Freed of their woody coating, the rubber particles form in small masses called "worms." The fiber is water-logged under pressure so that it sinks, permitting removal of the raw rubber. The "worms" are then placed in trays, dried, and pressed into 100-pound slabs for shipment. The rubber obtained by this process contains 16 to 20 percent resin and commonly sells at a discount of about 20 percent from the price of ribbed smoked sheet, which is the standard form of crude rubber imported from the Far East. Deresination of the rubber has not been customary because the resin is not disadvantageous when the product is used for special purposes, the needs for which are limited. Tests indicate, however, that when the resins are removed by simple treatment with a solvent, guayule rubber is equal in quality to high-grade plantation rubber.

Despite all the improvements in cultural and extraction methods, it has not been possible to produce guayule at a price competitive with that at which rubber from the tropics could be put on the New York market. The

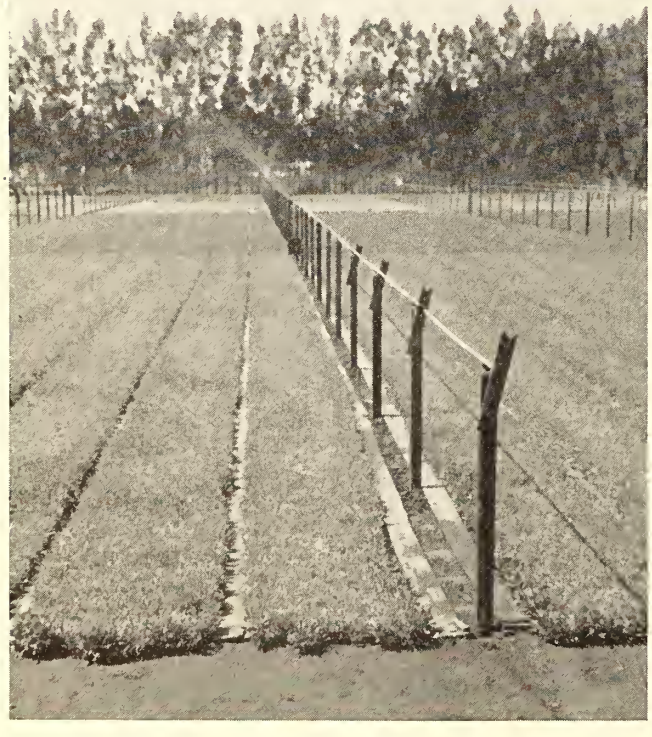
best information the Department of Agriculture has been able to compile indicates a production cost for deresinated rubber of not less than 23 to 25 cents a pound, assuming that plants are left in the field for 4 years. If plants are harvested before that time, of course, costs are materially increased. In comparison, the New York price for smoked sheet of first grade averaged 12.4 cents a pound during 1930–39, but was approximately 20 cents a pound in 1940, when the threat of war increased prices greatly.

Here is the Department of Agriculture's immediate program under the guayule rubber production act. Approximately 560 acres of plantings now existing in the Salinas Valley will be maintained. Present nurseries will supply seedlings for about 1,000 additional acres of field plantings this year at Salinas and for test plantings elsewhere in California, Texas, Arizona, and New Mexico and in Mexico. The entire present supply of improved seed purchased from Intercontinental will be planted in nurseries to supply seedlings for field plantings in the spring of 1943. Arrangements are being made for tests in Argentina, Chile, and possibly other countries of the Western Hemisphere, where natural conditions offer a prospect of successful cultivation. The reversed seasons south of the equator necessarily defer actual plantings for 6 months. Plans call for maintenance of present extraction factories and the construction of others.

All of the planting work for rubber production will be done by the Department's Forest Service, which through its Prairie States Forestry Project is familiar with many of the planting and operating problems involved. Test plantings and other investigations will be conducted by the Division of Rubber Plant Investigations, Bureau of Plant Industry.

Miracles of rubber production should not be expected from the guayule plantings. As Secretary Wickard pointed out in announcing the plan: ". . . the project . . . is not in itself an immediate solution of the Nation's rubber supply problem." It would take approximately 3,600,000 acres of guayule—or a tract larger than the entire State of Connecticut—to supply all United States rubber needs from this source. On the other hand, guayule is one of the quickest sources of natural rubber and it is undoubtedly going to be of considerable value in tiding the United Nations through the present crisis.

From the standpoint of insurance against the national disaster that complete loss of rubber would represent, it is fortunate that the guayule rubber project has been undertaken in conjunction with other emergency rubber supply measures. For long term supplies of natural rubber, at costs which are competitive with those of rubber produced anywhere in the world, the Department of Agriculture believes that the development of Hevea rubber culture in tropical America is the answer.



Seeds are planted in nursery beds to start guayule. Irrigation water comes from overhead pipes.

The seed harvesting machine works like a vacuum cleaner and is driven by a tractor.

Report From Haiti

The record of the first months of SHADA, the corporation organized in August 1941 to encourage agricultural development of the smallest, most densely populated of American republics as a means of stabilizing its economy and raising the national income.

The word SHADA may sound mysterious in the United States, but it enjoys the most respectable standing in Haiti, where it is the popular nickname of the Société Haitiano-Americaine de Developpement Agricole. This corporation, formed last year to encourage the agricultural expansion of Haiti, gives every evidence of justifying those who termed it one of the surest signs of the dawn of a new day for agriculture in tropical America.

Because it takes versatility to engage in farming in a tropical country which is beginning a new phase in its agricultural development, SHADA has dipped into many a field of Haitian economic life and has established an enviable reputation for business enterprise. It has interested itself in the production of rubber, lumber, naval stores, essential oils, fibers, spices, and handicrafts. In not much more than 6 months of existence, it has become one of the country's largest employers with 3,500 workers, all recruited in Haiti except a few technicians. It is operating a large forest and two plantations. Moreover, thanks to foresight and planning, it has been able to realize a profit each month since its books were opened.

While SHADA is interested chiefly in the production of tropical crops for export, it is not a commercial farming enterprise in the conventional sense. In accordance with agrarian tradition in Haiti, where a higher percentage of farmers own their own land than in any other American republic, the corporation's land holdings are being kept relatively small. The principal functions of SHADA's plantations are to provide technical assistance and processing facilities and to supply planting stock for distribution to Haitian farmers who will grow the crops for market. The only organization of its kind in the world, it is being watched with interest in several other Latin American countries where a similar plan is considered feasible.

Organization of the corporation in August 1941 was a result of the Haitian Government's desire to strengthen the economy of the tiny republic, whose troubles stem largely from an extreme density of population—seven times that of the United States and much the greatest among the countries of the Western Hemisphere. The country's political leadership believes that national economic problems can best be attacked with increased production of export crops, to be used in building up foreign exchange for the purchase of needed industrial goods. Opposed to this expansion, however, have been many barriers—notably the difficulty of competing with established supply centers and the lack of financial backing.

A forward step came in 1938 when an agriculture-minded Haitian national administration called upon the United States for suggestions and, upon recommendation of the Department of Agriculture, employed as its agricultural adviser Thomas A. Fennell, who was at that time Assistant Director of the Department's Research Center at Beltsville, Md. An extensive survey of Haitian agricultural resources was undertaken, and the plan upon which the present SHADA organization is based was developed.

Early in 1941, when rubber technicians from the United States visited Haiti at Mr. Fennell's request and reported the existence of several areas considered favorable for the production of plantation rubber, the government promptly signed an agreement with the United States to participate in the long-term project for the development of cultivated rubber in the Americas.

On the basis of these activities, the United States Department of State, in May 1941, announced an agreement in principle with the Haitian Government for cooperation between the two nations in developing the

Source

This story is based on information received from Haiti by the Office of Foreign Agricultural Relations. Previous stories in *Agriculture in the Americas* about the Haitian agricultural program were "Haiti Makes Rubber History" by Thomas A. Fennell, published in the July 1941 issue, and "Haitian Corporation Formed" published in October 1941.

All photos by T. A. Fennell.

Scenes in western Haiti, where SHADA is carving a plantation out of the jungle: (above) base office and storeyard at Chambellan; (below) laborers carrying stone for construction purposes at Source Chaude.

Land has been cleared and planting operations begun on the Source Chaude plantation. Workmen above are digging planting ditches. Below, a view of young Hevea rubber seedlings in SHADA's plant nurseries.

republic's economy. An active participant in the negotiations that led to this agreement was President Elie Lescot of Haiti. There followed a series of conferences on details, from which emerged SHADA, with a capitalization of $1,000,000 and with all stock owned by the Haitian government, but pledged to the Export-Import Bank of Washington as security for loans made under a credit of $5,000,000.

Under its charter, the corporation was given authority for all the various types of activity necessary in carrying on a large business designed to foster agriculture. It was authorized to grow any agricultural crop, to process, buy, and export all crops except bananas, to experiment in disease control and plant development, and to promote handicrafts related to agriculture. Three citizens of Haiti and three of the United States were chosen as directors. Mr. Fennell, whose previous work had done much to create an interest in such an organization, was named president and general manager. Within a few weeks a supervisory staff had been recruited, and field activities were under way.

SHADA was able to show a profit from the outset largely because of its lumbering operations, carried out in forests which the Haitian Government leased to the corporation as its payment for the capital stock. The forest consists of 150,000 acres of woodland in two tracts situated east and northeast of Port-au-Prince near the Dominican Republic border. The Government had been operating a small saw mill in one of these areas. SHADA added a larger mill, stepped up production and is now supplying Haitian builders with tropical forest products, which in the past they either imported or went without. In charge of these operations is the Forest Division, which is headed by L. R. Holdridge, formerly on the staff of the United States Tropical Forest Experiment Station in Puerto Rico.

Largest of the two SHADA-owned plantations is a 30,000-acre tract, near Source Chaude in the Grand' Anse River Valley, about 125 miles west of Port-au-Prince near the tip of the southern arm which Haiti thrusts into the Caribbean. There more than 2,000 corporation employees are engaged, under the supervision of Franklin E. Bradshaw, formerly in charge of the Fordlandia rubber plantation in Brazil.

The soil of this valley is considered excellent, but the area is so isolated that when SHADA began its operations, the Source Chaude region was decidedly primitive. It is wild country, reached from Port-au-Prince by a single automobile road which is not suitable for truck or other heavy travel. The trip takes 10 to 12 hours by car and is so strenuous that the staff of SHADA now travels by motor launch instead. In the valley itself there is only one road and the last lap of the journey to Source Chaude is a jungle trail 12 miles long.

Despite these handicaps, a base camp and a labor camp have been established in the area. To construct the buildings, materials were carried on men's heads 12 miles from the nearest road to the camp. The road situation is being tackled by a United States engineering firm that works in close collaboration with SHADA and the area will be served by a road within the next 6 months. By the end of 1941, 300 acres of land had been cleared and more than a half-million rubber seedlings had been planted in rich forest soil. Plant nurseries had also been established for ginger, peppers, and essential oils. Few tropical planters have ever battled tougher terrain than that at Source Chaude, but there is every indication that the growth of the area is definitely under way.

At the Bayeux plantation on the north coast of Haiti, work is much more advanced, since funds were made available by the United States Department of Agriculture for work in that region several months before SHADA was organized. This plantation, supervised by M. P. Copeland, formerly employed by the Firestone Rubber Company in rubber production in Liberia, consists of approximately 1,500 acres and employs between 1,200 and 1,400 workers. The entire area has been cleared and much of it is planted. More than 1,500,000 rubber seedlings are now growing and 300 acres are devoted to essential oils and spices. In the same area are 1,000 mature Hevea rubber trees, planted more than 39 years ago, and around 7,000 mature Castilla rubber trees. Between 15,000 and 20,000 pounds of rubber are expected to be obtained from these in 1942.

As can be seen, chief attention at both plantations has been concentrated on the establishment of rubber, the strategic product most urgently needed by the United States, but fibers, spices, essential oils, and many other tropical crops are on the corporation's agenda. It also expects to encourage improvement in the quality of Haitian cacao, in the belief that with more careful cultivation and preparation for market it can be made to compare favorably with the best in the world.

Once the plantations are well established, SHADA will proceed to the next phase in its development by entering into contracts with peasants of the adjacent areas for the production of crops which it desires to encourage. The corporation will furnish seed, provide technical assistance and supervision, and agree to purchase the crops after they are harvested. Thus, Haitian farmers will participate directly in the program and will in effect pool their products in the hands of the corporation for processing, grading, and introduction in the export market.

The Haitian and United States governments have seen no reason to revise their prediction of 6 months ago that SHADA will lead eventually to a doubled national income for Haiti—an income to be drawn from the soil and spent largely in trade with the other Americas at a time when war has cut trade lanes to most of the rest of the world.

America's Drug Plants

Quinine and coca and Balsam of Peru—these curative plants and many more the Americas gave the world. But the Western Hemisphere is not self-sufficient in drugs, so its farmers are growing new crops to help make up for lost imports from the war zones.

by E. C. HIGBEE

The Americas were in the drug plant business long before the days of Christopher Columbus. Early Indian medicine men of the Western Hemisphere cataloged their medicinal plants as conscientiously as any modern scientist records his findings. Rites of mystery conducted in the Orinoco Valley of Venezuela and the Yungas region of Bolivia relied for effect upon the virtues of ipecac, coca, and scores of other native plants with real or fancied curative powers.

In the days before America was discovered, India was Europe's main source of spices and drugs. Then sea lanes were shut off by the Arabs, and the sailors of Spain and Portugal set off westward to seek a new route to these necessities. They failed to reach India, but they found in the west a new land rich in drugs and spices. While the Americas could not provide unhappy Ponce de León with an elixir of immortality, they gave him and his contemporaries many plants which prolong life. For a large number of these, the world still depends chiefly on the Western Hemisphere.

One of the most important Latin American drugs is the shriveled root of the jungle herb, ipecac. Many a wailing infant has been quieted by a dose of this super-action stomach pump. Ipecac, a native of Brazil, is harvested almost entirely from wild plants by gatherers who pry the root from the soft forest floor with sharp pointed sticks. Brazilian Indians are known to have used it to treat dysentery. Today scientists know that emetine, an alkaloid obtained from ipecac, poisons amoebae. It is employed to treat amoebic forms of dysentery and pyorrhea.

Balsam on the Battlefield

Word from first-aid stations at the battle fronts of the world tells of the wonders of Balsam of Peru, which is not Peruvian at all but the most important medicinal product of El Salvador. It acquired its name in the days of the Spanish empire when it was so jealously prized by Madrid that every legitimate gram of it had to pass under the eagle eye of the imperial customs station at Callao, Peru, before it could leave the new world. The balsam is obtained by removing patches of bark from the tropical *Toluifera pereirae* tree and scorching the wounds with torches. The heat causes the pitch to flow, and it is sopped up by cotton cloths placed over the wound. When the cloths are wrung out in crude rope presses the pure liquid balsam is obtained. Countless lives have already been saved in field dressing stations by the quick application of a protective coat of this antiseptic to the surface of wounds.

The modern surgical patient who is relieved of pain by a skin application of the local anaesthetic, cocaine, can imagine the bewilderment of the first Andean Indian who found his toothache eased when he chanced to chew the leaves of the South American coca plant, from which the drug is derived. Most of the world's coca still comes from Bolivia and Peru, where its production is a considerable industry.

Ipomea and jalap are important purgatives obtained from the roots of vines native to the eastern slopes of the Mexican Sierra Madres. The roots of jalap, cut from wild plants, are dried in nets hung in the smoke of hearth fires in the homes of the gatherers. Sun-dried ipomea root has a therapeutic action similar to scammony, which is produced in countries of the eastern Mediterranean and is now difficult to obtain.

Honduras and Mexico supply sarsaparilla, the dried root of the prickly stemmed shrub of that name. It is one of the most commonly used of the new world's drugs. As early as the sixteenth century it was employed by European physicians in the treatment of syphilis. Although its curative powers in that respect are discredited today, it is still popular as a tonic and flavoring material to

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make certain medicinal preparations more palatable.

In the cavities of the trunk of the *Vouacapoua araroba,* a tree growing in the damp forests of the State of Bahía, Brazil, is found a yellow powder used in the treatment of ringworm, eczema, and other skin afflictions. The virtues of this substance have been known to Brazilian natives a long time. Goa powder, as it is called, is collected by felling the tree and sawing the trunk into lengths. These logs are split into smaller pieces and scraped to obtain a powder, from which is extracted the drug known as chrysarobin, an ingredient of many skin ointments. The laborers who do this work sometimes suffer painful eye and skin irritations because of the strength of the powder.

Drugs From Beverage Plants

Colombia and Venezuela produce the throat-soothing tolu balsam. The best sources of caffeine used in many headache remedies are the South American beverage plants, coffee, kola, mate, and especially guarana, which contains as much as 5 percent of the drug. Theobromine, an important circulatory stimulant, is derived from cacao, one of the basic products of Latin America.

Butter from the nuts of the Caribbean nutmeg tree is used in ointments for sprains and rheumatism. Cubeb, the pepper that is smoked for the relief of asthma, is produced in the West Indies. So are pomegranate, the bark of which expels tapeworm, and quassia, the excellent bitter. The irritant sabadilla is a Central American specialty. Copaiba, a native of Venezuela, was used in the treatment of gonorrhea before the sulfonamide drugs were introduced and is now employed in some cases of chronic bladder infections.

Chile is the world's principal source of soap bark, used to provoke nausea and to emulsify tar compounds. That country also produces rhatany root, valued as an astringent and reported by some surgeons to aid the healing of wounds. Brazil is the home of the important pilocarpus, which produces physiological reactions opposite to those of belladonna. The same country is among the world's greatest producers of the castor bean, which has been valued as a medicine since ancient Egyptian times but today is more important for its industrial uses than as the traditional bugaboo of children.

The United States produces a few nontropical drugs in considerable quantities. For more than 100 years Maryland farmers have been producing chenopodium, or wormseed oil, which is widely used as a vermifuge for the treatment particularly of sheep and swine. There is an annual production in this country of around a half million pounds of the aromatic stimulant, peppermint oil, which is obtained from the perennial peppermint herb cultivated chiefly on the mucklands of southern Michigan, northern Indiana, and in the Pacific Northwest. From the Pacific Northwest, too, comes the laxative cascara sagrada bark, harvested from wild trees.

Not all the drugs on which the Western Hemisphere depends, however, have been produced by its own farmers. While the hemisphere can grow almost any plant known in the world, it has not been considered practical to try and compete in drugs with cheap labor conditions in the tropical regions of Asia, Africa, and certain parts of Europe. American growers have specialized in wild products that brought good returns and have attempted little cultivation of drug plants.

The war has changed the situation and brought the Americas to the opening of a new chapter in the story of drug plants. National borders picketed with troops and ships are barring the way to essential supplies. Stockpiles in warehouses will be adequate for a time, but the consequences of the war will soon be noted on the shelves of pharmacies throughout the United Nations unless Western Hemisphere farmers are able to go into their own fields and swamps and gather strange medicinal plants as well as the familiar ones. That is why the American republics have flashed a beacon to refugee drugs all over the world, guiding them to western soil.

Perhaps the best known of the Hemisphere's deficit drugs is quinine, obtained from the bark of the cinchona tree. Today this American native, long neglected in its homeland, is being planted with skillful care in plantations in Central and South America (*Agriculture in the Americas,* March 1942) in the hope that some day every malaria victim in the Americas may be supplied with home-produced quinine at the lowest possible cost.

United States farmers and drug houses are preparing to make small but adequate plantings of deadly aconite, which is a helpful heart medicine and sedative when properly administered. In the past it has been imported from Europe. There will be increased production this year of the important sedatives and heart medicines, belladonna and digitalis, and the anodyne, henbane. The laxative seaweed, agar-agar, is being gathered off the coast of southern California, since supplies from the China Sea have been cut off.

Sap That Soothes Stomachs

Cuba is ready to expand the production of the papaya tree, from the green fruit of which comes the drug papain, ordinarily imported from the Far East. When the rind of the papaya fruit is cut, a sap exudes and hardens into white papain powder. This contains enzymes that digest flesh, as many a harvester can tell by his blistered hands. It has been used to treat indigestion and is reported to have healed ulcerated stomachs. The tree also grows in Mexico, and housewives along both sides of the Rio Grande have learned to wrap tough steaks in papaya leaves, which tenderize the most knife-resistant cuts.

Commercial growers in Guatemala are planning to cultivate belladonna and digitalis. They also expect to try their hands at scores of other drug plants, including two important laxatives—cassia fistula, some of which already comes from the Dominican Republic in the Western Hemisphere, and tamarind, imported largely from India. Chile is producing the gentle carminative, fennel, although most of it has been grown in Europe and Asia.

One of the most time honored household remedies is "confection of senna," a collection of laxative roots, leaves, and seeds. Its most important ingredient is senna leaves heretofore obtained from India and Egypt. Brazilian plant explorers have reported over 200 varieties of senna growing wild in their country. Some of these are said to equal the finest imports.

The bitter and cathartic juice gathered from the succulent leaves of the cactus-like desert herb, aloe, has long been one of the principal products of the Island of Curaçao in the Netherlands West Indies, but not enough has been produced there to satisfy the needs of this hemisphere. The aloe plant is now being set out in plantations in the Dominican Republic to compensate for supplies formerly brought from Arabia and Africa.

It is believed that Peru could grow the nerve-quieting asafoetida, normally imported from India, and the tragacanth thorn tree of Iran, which yields gum for cough drops. Argentina and Uruguay could probably raise the laxative, psyllium seed, and supply ergot, those strange diseased kernels of rye and other grains which ease the pain of childbirth. Ergot is ordinarily obtained from Europe and psyllium seed from Europe and India.

Promising Dark Horses

Not only can the Americas grow unfamiliar drug plants, but there seems real possibility that the world's drug store can be augmented through further investigation of native American plants not now fully appreciated. For the most part these are used by primitive people and the claims made for some of them may seem stretched beyond reason, but they should not be dismissed too hastily. After all, the powers of quinine seemed fantastic to the Spaniards who first found American Indians using it.

The Indians of Peru and Colombia, for instance, make daily use of hundreds of native roots, seeds, and leaves said to have important values, although there has been little clinical investigation. Among the plants unfamiliar to medical schools are some said to cure heart trouble, tuberculosis, diabetes, pneumonia, and trichinosis. The Indians of Amazonian Ecuador prepare an arrow poison, which they call curare, from the juice of several poisonous plants. Recent experiments have indicated it may be valuable as a temporary muscle paralyzer which may be especially useful in preventing spinal fracture from convulsions in the shock treatment of insanity. A recent study has revealed that the Indians of the State of Nevada use more than 300 native medicinal plants, some of which might eventually have commercial value.

Courtesy Fritzsche Brothers, Inc.

Collecting Balsam of Peru in El Salvador. Workmen climb trees to make cuts from which balsam seeps.

In the cultivation of most drug plants, an abundant supply of hand labor is more important than large acreages of land. The entire annual consumption of quinine in the United States, for example, comes from the bark of trees grown on only about 1,500 to 2,000 acres. The several million pounds of psyllium seed imported each year grow on about 3,000 acres. We purchase the output of 600 to 1,000 acres of aloe, 1,500 to 2,000 acres of senna, and 1,000 acres of ipecac. Returns per acre are often high, however, and indications are that an expansion in drug plant cultivation would be profitable in many parts of the Americas where farms are small, labor is plentiful, and cash crops are needed.

As in the case of a variety of other tropical crops, increased production of drug plants in Latin America is much more than an emergency measure. It is a step in integrating American agriculture in such a way that the export crops of various regions of the Western Hemisphere will be complementary rather than competitive. Thus it is an essential part of the program to develop the economic unity and strength of the Americas as permanent bulwarks against aggression.

Panama—New World Crossroads

The story of the Panama Canal has been told many times, but here are some less familiar facts about the interesting tropical republic that surrounds it, with emphasis on the natural resources of the country and its ambitious new agricultural program.

by PHILIP LEONARD GREEN

Geography made the Isthmus of Panama a world crossroads. As long as man can remember, travelers have been crossing this narrow neck of land that links North and South America, for nowhere else do the Atlantic and Pacific oceans press so closely together and nowhere else does the mountain backbone of the Americas dip so low. It boomed in Spanish colonial days and again during the California gold rush of 1849. Then came the Canal and Panama's modern heyday.

The Canal, dreamed of as early as the days of Charles V and Philip II, was opened to general traffic in 1920, and its effect on world commerce was profound. It reduced the sea trip from New York to Valparaiso, Chile, by 3,747 miles; to Callao, Peru, by 6,250 miles; and to Guayaquil, Ecuador, by 7,405 miles. In normal times, about 6,000 ships pass through the Canal in a year.

The Canal Zone is a strip across the full 50-mile width of the Isthmus and extending 5 miles on either side of the center line of the Canal. The United States holds the use of this strip in perpetuity and in return for the concession makes an annual payment and guarantees to maintain the independence of the Republic of Panama. Because of the peculiar shape of the Isthmus, the Atlantic Ocean is at the western end of the Canal and the Pacific at the eastern, and the Pacific side of the Zone is the only place in the western world where the morning sun rises out of the Pacific.

Within the boundaries of the Zone but excluded from it politically by agreement are the two largest cities of the Republic—Panama City, the capital, at the Pacific end, and Colón at the Atlantic end. Both are cosmopolitan centers and models of tropical sanitation. Each has as its twin a Canal Zone city which constitutes United States territory, Balboa adjoining Panama City and Cristobal being separated from Colón only by the tracks of the Panama railroad.

North and south from the canal stretches the Republic of Panama, with an area about equal to that of West Virginia and a population of 535,000, a fourth of whom live in Panama City and Colón. It is the youngest American republic, having been an independent nation only since 1903, although it became free of Spain in 1821.

The "interior," as city dwellers call the area outside the Zone, is a tropical land of considerable agricultural potentiality, laced by almost 500 rivers. Among its chief cities are David, a stopping point on the airline from the United States to the Zone, and Natá, which has the oldest church building in the Western Hemisphere.

Courtesy American National Committee of Engraving.

Un Paisaje Campestre en el Interior de la Republica
(Rural Landscape in the Interior of the Republic)
A block print by F. R. Carcheri of Panama

Although the sale of goods and services to residents of the Canal Zone is far and away the largest business of the republic, it produces a fair variety of farm products for export and its foreign trade has shown consistent gains. The principal crop is bananas, grown along both coasts. Cacao comes second and is of good quality. Coconuts were once grown extensively for export in the San Blas region on the northeastern coast, but plant parasites have depressed this industry. Chiriquí province, bordering Costa Rica, is an important cattle and coffee region and also produces timber. The waters around the "Las Perlas" Islands in Panama Bay yield the well-known Panamanian mother-of-pearl. Some sugar and medicinal plants are also grown for export, and rubber production has been started with governmental aid and the cooperation of private companies.

The development of manufacturing industries in Panama has been rather limited. Sugar, rice and con-

densed milk are processed locally and beer, liquors and a few other items are produced, but industrial progress has been hampered by lack of sufficient raw materials, skilled labor and capital. So the country depends for most of its manufactured goods on shipments from abroad.

Too Many Imports

Panama is also dependent to a surprising extent on imports for agricultural goods, despite its wealth of farm land. That is largely because the country has been able to prosper from its "invisible" exports—the goods and services sold to Canal travelers and workers. Furthermore, employment opportunities in the Zone have been a constant lure to workers who in other Central American countries are content on the land. Such products as flour, butter, eggs, potatoes, canned meat, vegetable oils, mineral oil, rice, fruits, and timber products have figured in the country's imports, even though most of them could easily be produced domestically. There have even been imports of fish, despite the fact that they abound in adjacent waters and the country's name, in the language of its aboriginal inhabitants, means "abundant in fish."

Production of potatoes and rice has been upped considerably in recent years, but not enough to prevent the war from bringing a serious food supply problem to Panama, what with added population and the scarcity of shipping facilities from the usual sources of supply. Seeking solutions in a number of different directions, the government has been casting about for new food sources: Ecuador for rice; Cuba for sugar, alcohol and dressed meats; and other Central American countries for eggs and vegetables. Import duties have been lowered on milk, eggs, butter, prepared meats, ham, bacon, fish, fresh vegetables, meat extracts, soup concentrates, beans, biscuits and nontropical fruits. Price ceilings have been placed on potatoes and other commodities.

In the last few months the new Panamanian national government which took office in the fall of 1941 has launched a program of systematic production that should have much more than emergency value and should add immeasurably to the wealth that Panama can derive from its agricultural, pastoral, fishing and forest industries.

The first step came on December 19, 1941, when announcement was made that the government had set aside a $1,000,000 fund for developing the nation's agriculture. Two days later the National School of Agriculture was opened at the town of Divisa. In a recent speech, the Minister of Education declared that the educational curriculum of schools in the interior would be changed radically to "harmonize studies with the intensification of agriculture." Students and teachers have already been called upon to help gather crops so as not to jeopardize the harvest.

Within a week after the announcement of the $1,000,000 fund, the Ministry of Agriculture sent a group of engineers to the interior to make irrigation surveys. In this way it was hoped to pave the way for growing crops during Panama's December-to-May dry season. On January 9, 1942, the government set aside $250,000 for the purchase of agricultural equipment in the United States. Two weeks later, this was increased to $325,000.

On January 16, 1942, the government announced that it had employed a Cuban agricultural expert as instructor in the Ministry of Agriculture and Commerce. The following day, a decree came out enabling the government to take over lands considered suitable for agriculture, during the war, issuing temporary licenses for its cultivation. Reports are that landowners throughout the interior are offering their property voluntarily for this purpose.

Toward Self-Sufficiency

The government also sponsors a daily agricultural radio program. Reports from interior towns indicate that agricultural committees are being set up in rural communities. The rising prices of foodstuffs have made the people realize what a blessing self-sufficiency would be. For the first time they are truly aware that the soundest nations are those with deep roots in the soil.

The United States would, of course, welcome the success of Panama's agricultural program, for it would provide this country's Canal Zone forces with a nearby source of many foods and relieve the strain on shipping facilities now used in transporting food from the States.

The present Panamanian government is also much interested in a comprehensive plan for sanitation, education, immigration, road building, and cooperative marketing. It has indicated the possibility of undertaking low-cost housing projects and has begun a study of living costs.

The closest of economic and political ties prevail between Panama and the United States, which supplies more than half the republic's imports and, including purchases for use in the Canal Zone, buys 90 percent of its

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exports. Under a treaty ratified in 1939 several economic problems that endangered good relations were settled. The same treaty made Panama a copartner in the defense of the Canal, a step of profound significance.

The strategic importance of the Panama Canal can scarcely be overstressed, and the lack of full cooperation between the two countries could have tragic consequences. Thus it is reassuring that this country's efforts to strengthen and enlarge the Canal are being ably seconded by Panama and that non-American propaganda, which once enjoyed a happy hunting ground on the Isthmus, is now firmly under control.

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ALONG THE *Agricultural Front*

▲ Brazilian Tree Yields Cork Substitute

The world's supply of cork comes from an oak which is grown commercially only in the Mediterranean region, but Brazil has its own cork substitute, the bark of a hardwood tree that flourishes in its forests.

The tree (*Eielmeyera coriacea Mart.*) is one of the most abundant in the forests of south central Brazil, where it is known as Pau Santo or Pau Santo do Cerrado. Present production of the bark is about 8,000 tons a year, and two small plants at São Paulo are producing insulation from the material. It is reported that capital and improved transportation would be required for expansion of production.

▲ Vegetable Oils Expert To Amazon Valley

In an effort to develop an interest in expanding production in the Amazon Valley of vegetable oils needed in United States industries, Vernon F. Wright has gone to Belém, Brazil, as a representative of the agricultural division of the Office of the Coordinator of Inter-American Affairs. Mr. Wright, formerly Brazilian buyer for a United States food firm, will deal with problems of acreage expansion, financing, transportation, and labor involved in increased production of coconut, palm, and other vegetable oils which this country formerly imported from areas now cut off by the war or of substitutes for them.

These are yatay palms, which grow wild on the rolling plains of Argentina's "Mesopotamia" region and which yield a fiber believed to be a possible substitute for Algerian *crin vegétal,* imported into the United States from Morocco. It is in fact known in Argentina as *crin vegétal,* although it comes from an altogether different tree than the African product. The fiber is in the leaves of the tree. It is used locally to a limited extent as a mattress filler. In this country, *crin vegétal* is used for cheap mattresses, cushions and linings of automobiles. Imports from Morocco in 1939 amounted to 5,000 tons, valued at more than $125,000.

▲ War Hits Ecuador's Tagua Nut Industry

The war is seriously affecting one of Ecuador's most important agricultural industries, the production of tagua nuts, which yield the product called vegetable ivory, extensively used in the manufacture of buttons and similar products. Although Argentina is buying larger quantities of tagua nuts and shipments are still being made to England, the closing of the formerly important German, Japanese, and Italian markets is being felt. As a result, it is expected that a good many tagua nut producers will turn to other crops, including rubber, rice, and sugar.

▲ New Crops for Colombian Banana Zone

Diversification of farming is reported under consideration for Colombia's Santa Marta banana zone, since the banana industry has been hard hit by sigatoka disease, the loss of European markets, and lack of suitable credit facilities. A recent survey showed that conditions in the area are favorable for the cultivation of grapes, and there are also prospects for the growth of rice, peanuts, and coconuts.

▲ Jute Cultivation in Brazil Reported Succeeding

Efforts to cultivate Indian jute in the Amazon Valley of Brazil are succeeding, according to information received in the U. S. Department of Commerce. There is no other fiber known which is equal to jute for the bagging, sacking, and baling material needed in the cotton industry of the United States and the coffee industry of Brazil.

Local authorities say that the vast plain extending on both sides of the Amazon River in the State of Amazonas, irrigated by numerous streams and periodically flooded by heavy rains, should lend itself to the cultivation of the fiber. Thus, Brazil can

produce an item formerly imported in huge quantities and one for which there is a constant demand in other Latin American Republics and in the United States.

▲ Latin American Institute Established in Boston

A group of authorities on the economics of Latin America has announced the formation of the Latin American Economic Institute, 24 Federal Street, Boston, Mass., as "a voluntary, independent, nonpartisan, nonprofit organization, studying the economic problems centering in Latin America." Its first two volumes announced for publication are "The Economic Defense of the Western Hemisphere, A Study in Conflicts" and "New England, War, and Latin America," the latter prepared in cooperation with members of the Boston University faculty.

▲ Insect Parasites Studied At Uruguayan Station

Following the closing of stations in Europe and the Orient, the United States Bureau of Entomology and Plant Quarantine has established a new parasite station at Montevideo, Uruguay, and most of the European staff has been transferred to South America to continue the study of parasites destructive to the boll weevil, pink bollworm, sugar-cane moth borer, white-fringed beetle, and other Latin American insects.

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Argentina has added a National Tobacco Institute to its Ministry of Agriculture to formulate national policy in encouraging and improving Argentine tobacco culture and promoting marketing of the crop.

▲ Agricultural Institute Created in Brazil

To meet an urgent need in Brazilian rural economy, the Institute of Agricultural Experiment has been created. Here, experimental plans are studied, discussed and, if approved, put into practice throughout the country through 36 experimental substations. Results of these plans, filed and analyzed in a central experiment station, will constitute a source of material for future agricultural planning in Brazil.

▲ Pulp Made from Paraná Pine is Tested

The Commercial Attaché of the United States in Rio de Janeiro, Brazil, reports that chemical paper pulp has been made successfully from Paraná pine. The tree grows profusely in the States of Paraná and Santa Catarina. The Chemical Institute of Paraná is now conducting experiments to determine the qualities of the pulp, its production costs and commercial and industrial possibilities.

▲ Commercial Relations Strengthened

Commercial relations between Venezuela and Colombia have been strengthened considerably by the recent frontier agreement between the two countries.

In an effort to exploit development possibilities, arrangements for free land transit and free river navigation have been made which will open up ample trade routes for the two countries. This will place the most remote regions of Venezuela and Colombia in contact with centers of civilization.

▲ Egg-drying Industry in Argentina

Argentina has created an egg-drying industry to utilize the surplus created when Great Britain cut off her shell egg imports because of shipping conditions. The first plant, opened late in 1941, has an egg-drying capacity of about 1 million eggs or 11 tons of powder per day. A recent decree of the Government establishes rigorous inspection in order to provide eggs of the quality needed for drying.

▲ Substitute Proposed for Cod-Liver Oil

From Brazil comes news of the use of oil from the liver of the cação, a Brazilian fish, as a substitute for cod-liver oil in the preparation of concentrated fattening foods for animals. Other uses of cação oil, as reported by the São Paulo Department of Agriculture, include soap and candle manufacture, tanning, and as a lubricating oil when combined with margarine. Production can be increased considerably if there is sufficient demand for the cação livers.

▲ Brazilian Factory Extracts Caffeine From Mate

A factory has been established in the State of São Paulo, Brazil, for the extraction of caffeine from mate, the tea of South America. It is estimated that the factory will use 6,000 kilograms of mate per day and will produce 60 kilograms of caffeine, enough to meet about half the caffeine consumption of the entire country.

AGRICULTURE IN THE AMERICAS ROBERT H. INGRAM, EDITOR

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Leo S. Rowe

OUR MUTUAL FRIEND

For more than two decades, Dr. Leo S. Rowe has presided over the Pan American Union as its Director General. He is almost as much a part of the handsome Washington home of the Union as are the murmuring tropical patio and the Aztec garden that make it one of the most charming of public buildings.

A varied career as a lawyer, educator, and political scientist, along with travel over most of the Western Hemisphere, qualified him for the directorship to which he was appointed in 1920. The experience of those full years has stood him in good stead in one of the most exacting diplomatic and governmental positions in Washington.

Born in Iowa, Dr. Rowe reversed Horace Greeley's maxim and early headed for Pennsylvania. He was graduated from the University of that state and, after a four-year stay in France, Italy, Austria, and Germany, received his doctorate from the University of Halle in Prussia. He was admitted to the bar but elected a teaching career and became an instructor in municipal government at the University of Pennsylvania, later advancing to head professor of political science.

Dr. Rowe combined with his academic life an international career made possible by leaves of absence from the University for special public missions. His first such leave took him to Puerto Rico as a member of a committee to revise and compile the laws of that island. In 1901 and 1902 he was chairman of the Insular Code Committee, which reported findings that were adopted substantially unchanged as the law under which Puerto Rico is now governed. The year 1906 found him in Rio de Janeiro as a United States delegate to the Third International Conference of American States, and since then he has regularly attended most of the important inter-American scientific, economic, and political meetings.

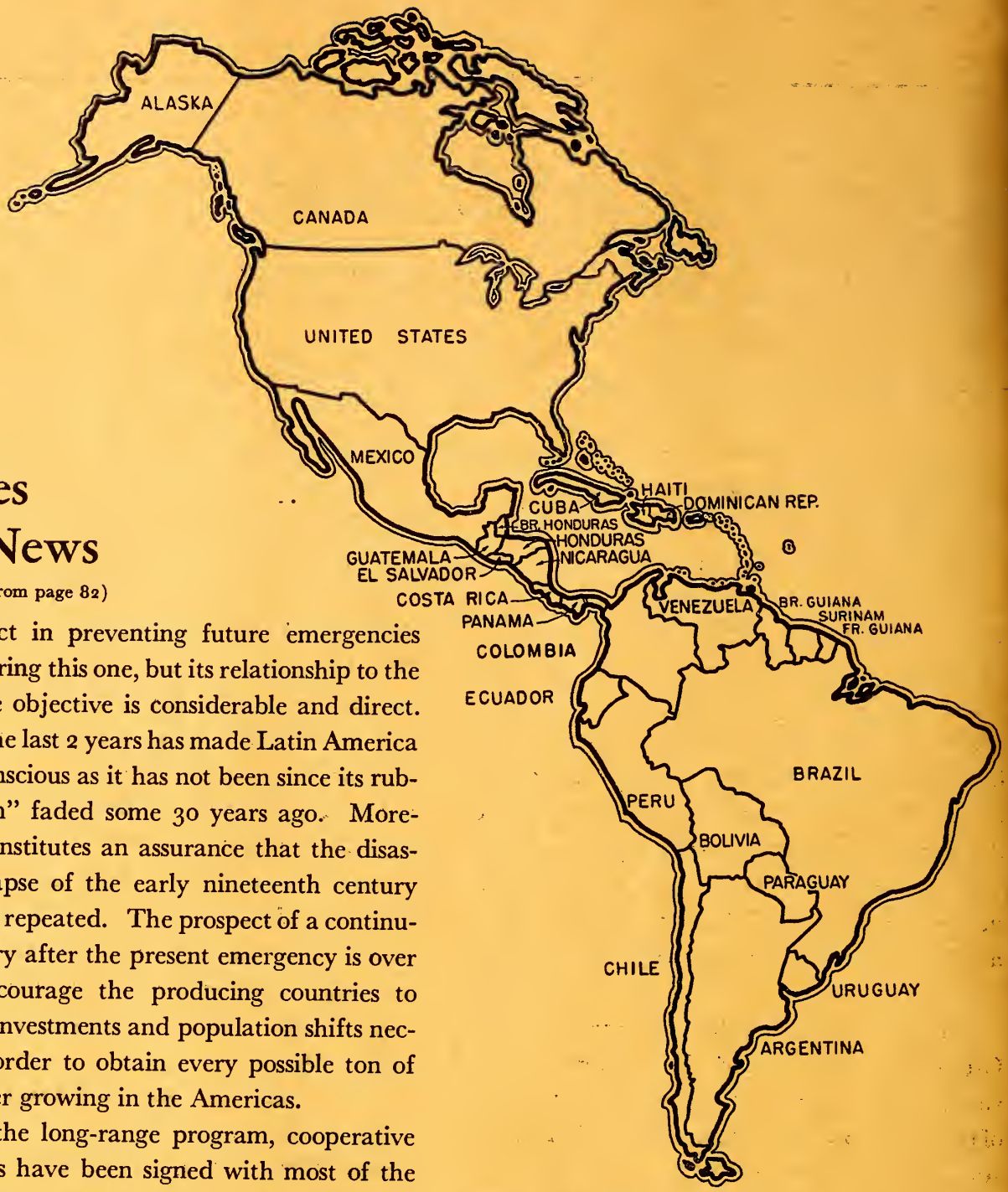
In 1917 Dr. Rowe was appointed Assistant Secretary of the United States Treasury. He served 2 years in that position and a year as chief of the Latin American Section of the Department of State before his appointment to head the Union.

Along with his activities at rostrum and round table, Dr. Rowe has found time to contribute articles, monographs, and reports to numerous economic, political, and scientific journals.

Dr. Rowe's contributions to the cause of Pan Americanism have been recognized with honorary degrees from the Universities of La Plata, San Marcos, and Chile and with national decorations of most of the Latin American countries which bestow such honors. Less formal but equally sincere recognition of his services is afforded by the warm regard in which he is held by Americans on both sides of the equator.

Names and News

(Continued from page 82)



more effect in preventing future emergencies than in curing this one, but its relationship to the immediate objective is considerable and direct. Work of the last 2 years has made Latin America rubber conscious as it has not been since its rubber "boom" faded some 30 years ago. Moreover, it constitutes an assurance that the disastrous collapse of the early nineteenth century will not be repeated. The prospect of a continuing industry after the present emergency is over should encourage the producing countries to make the investments and population shifts necessary in order to obtain every possible ton of wild rubber growing in the Americas.

Under the long-range program, cooperative agreements have been signed with most of the tropical Latin American countries, and work is in progress in five experiment centers to develop strains of Hevea rubber suitable to tropical American conditions. In 11 countries, improved planting material developed under the project has been furnished to government or private agencies for local plantings.

These then are the panzer troops and the supporting divisions of natural rubber production in the Western Hemisphere—co-fighters with the forces of synthetic rubber development in averting a national crisis. They are fighting with budwood in place of bullets, with machetes in place of machine guns, yet they may have quite as profound an effect on the outcome of the war as will the armed might of the United Nations.

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IN THIS ISSUE

June 1942

The Tingo María Agreement

Early in April, *David Dasso,* Peru's able, energetic Minister of Finance and Commerce, arrived in the United States. When he took off for home four strenuous weeks later, the Rio Conference pledge of economic cooperation among the Americas had been reinforced by four new U. S.-Peruvian accords.

Here are the agreements, as announced by Secretary of State *Cordell Hull:* (1) Increased production in Peru of strategic materials and U. S. purchase of that country's output of rubber for 5 years; (2) Export-Import Bank credit to finance Peruvian public works and development projects; (3) purchase by the Commodity Credit Corporation of Peru's surplus cotton for the duration of the war; and (4) cooperative establishment of an agricultural experiment station at Tingo María, in the eastern foothills of central Peru.

All affect Peruvian agriculture. The Tingo María agreement is of particular interest as a unique departure in inter-American agricultural relations.

Three years ago the Peruvian Government established a colonization project in the tropical, heavily forested Tingo María valley in an effort to relieve overpopulation along the country's cotton- and sugar-producing western coast. Some 200 families moved to the region. Test plantings were established of tropical fruits, vegetables, forage crops, rotenone-bearing plants, oil-bearing plants, and rubber. A modern highway from Lima was built and work was begun on a road that by the end of 1942 will complete the land and water connection between the area and Iquitos, Peru's Amazonian port, from which jungle produce moves into world commerce.

Plans to expand the project, discussed since early 1940, were put in writing at the Rio Conference, gained support from the Office of the Coordinator of Inter-American Affairs and crystallized into a working program April 21 over the signatures of Minister Dasso and Secretary of Agriculture *Claude R. Wickard.*

The agreement, in brief, calls for the construction in the Tingo María region of an agricultural experiment station to be managed jointly by the two governments. Peru will furnish the buildings and not less than 1,250 acres of land; the United States will provide equipment not obtainable in Peru and the services of a director and certain other members of the scientific staff.

The station's responsibility will be to encourage farming that pays in the Tingo María region and in general over the entire Amazon Basin in Peru. Emphasis will be on cash crops that complement United States production, but such home consumption essentials as fruits, vegetables, poultry, and livestock will not be neglected. Demonstration farms will be operated and planting material will be produced for distribution.

While setting the stage for Peruvian agricultural development to come, the station will be by no means unimportant in the emergency effort of the American republics to obtain scarce raw materials. It will provide an expanded headquarters for work on experimental plantings of rubber trees in the Tingo María vicinity. Moreover, it should stimulate immediately the production of several natural forest resources, notably wild rubber, rotenone, and vegetable oils.

The agricultural leadership of the Americas,

(*Continued on page 120*)

Agriculture IN THE *Americas*

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Plant Fibers in Wartime

A look at what is being done and what more can be done in the Americas to solve the emergency problem created by the fact that much of the world's commercial fiber production is normally concentrated in areas that are now under the control of the Axis.

by HARRY T. EDWARDS

If all the products made from plant fibers were to be removed, civilized life as it is known today could no longer exist. In every home and shop, in every factory and mine, and on every farm and ship, there are almost countless products made from the slender, thread-like filaments which are produced by a wide variety of plants. Textile fabrics for clothing and household furnishings; cables, ropes, twines, and threads for towing ships, binding grain, and catching fish; millions of burlap bags for packaging raw materials and manufactured products—these are a few of the hundreds of articles that are made from plant fibers.

Since nearly two thousand recognized species of plants yield useful fibers and fibrous materials, there tends to be a good deal of confusion about their characteristics, uses, and interchangeability. The subject is not so complex as it appears, however, for only a few of the hundreds of known species are used in large quantities in industry, and these divide quite satisfactorily into three classes. Here is the usual classification, with the leading examples of each class:

Hard fibers, which extend through the pulpy tissues of the leaves and leaf stems of plants. The hard fibers of primary importance are abacá, sisal, and henequén, all of which are used in the manufacture of different types of cordage, particularly that in which tensile strength and durability are desired. For some types of cordage, the hard and soft fibers are interchangeable.

Soft or bast fibers, which are obtained from the inner bark of plants. The outstanding fibers of this sort are flax, hemp, and jute, the most important uses of which are in both fine and coarse textile fabrics and many different types of cords, twines, and threads.

Seed fibers, which are produced inside of seed pods. The leading product of this type is cotton, perhaps the most versatile of all fibrous substances. Kapok, which belongs in the same group, is used in the manufacture of life-saving apparatus, insulation, and upholstering.

Nature scattered useful fiber plants widely over the face of the globe, but mankind through the centuries has done a thorough job of rearranging them so that today production of most of the leaders has become concentrated in the Eastern Hemisphere, particularly in the tropical regions of the south Pacific. The Western Hemisphere, while relatively self-sufficient in food production, has never gone in heavily for the production of fibers in competition with low-cost areas of the East and is on an import basis for all of the principal fibers mentioned except cotton and henequén.

The wide separation from the sources of supply may not be particularly efficient, but under normal conditions, when production is uninterrupted and there is no interference with transportation, it is ordinarily possible for

The Author

Mr. Edwards, on the staff of the Bureau of Plant Industry, is in charge of Department of Agriculture research on plant fibers other than cotton. He was an agricultural specialist with the Philippine government from 1901 to 1916 and last year was a member of a party that surveyed fiber production and other agricultural possibilities of Mexico and Honduras at the request of those governments.

every country to obtain its required supply of these materials. The situation is radically changed when a world war stops the production of fibers in regions where military operations are in progress, closes many of the sea lanes, and destroys ships by the score. War manufacturing increases the demand for most of the fibers, and it becomes necessary either to produce some of the plants in regions where they have not been grown previously or to obtain acceptable substitutes. This is the situation which now confronts the American republics and to some extent practically all of the United Nations.

Cotton, of course, is produced abundantly in the Western Hemisphere. The fiber problem of the Americas in the present emergency thus consists essentially in finding ways of maintaining adequate supplies of abacá, sisal, henequén, flax, hemp, jute, and kapok or of providing substitutes for them. It is not a problem to be solved off-hand, over a cup of coffee, but it is far from insoluble. Current progress and future prospects can perhaps best be appraised by discussing the fibers one at a time.

The Hard Fibers

Most important of the hard fibers is abacá, normally one of the leading export products of the Philippine Islands. Although it is not a true hemp and is not grown in the immediate vicinity of Manila, it is known to the trade as Manila hemp, probably because the term hemp has been used loosely for years and because exports originate in Manila. The word "abacá" is of Malay origin and is used in the Philippines to designate both the plant and the fiber.

With the exception of relatively small quantities produced in the Netherlands Indies and Borneo, the entire world supply of abacá fiber has been obtained from the Philippines, to which the plant is native. The records of Ferdinand Magellan show that abacá was being grown and used in the Philippines when he visited the islands early in the sixteenth century. During the next 300 years the fiber was used to some extent by the Spaniards in the Philippines for the manufacture of cordage, and during the early part of the nineteenth century an officer in the American Navy brought samples to the United States. It was found to be an exceptionally valuable rope fiber, and in 1818 about 40 tons were imported. In course of time abacá became the leading export product of the Philippines, and at one time early in the twentieth century it represented two-thirds of the total value of all products exported from the Islands.

The abacá plant, a perennial, is closely related to the banana plant, which it resembles in appearance. A mature abacá plant or "mat" consists of a group of from 10 to 30 stalks, each of them composed of the overlapping leaf stems, the outer portion of which contains the fiber. The plant produces a green fruit that looks like a small banana but is filled with black seeds. As abacá plants grown from seeds do not come true to type, the usual method of propagation is by the use of suckers or rootstocks. In cleaning the fiber, the outer fibrous portion of each leaf stem is stripped off in the form of ribbons. To remove the pulp and waste material, these ribbons are drawn under a knife that rests on a block of hard wood. Small machines that are a modification of the hand-stripping process are used for cleaning the fiber in the southern part of the Philippines. In Sumatra large automatic machines are used.

In 1925 the United States Department of Agriculture brought a shipment of abacá plants from the Philippine Islands to the Republic of Panama. These plants were first grown in a quarantine station on Columbus Island and were afterward removed to the mainland near the town of Almirante. Experimental work was carried on both in growing the plants and in cleaning the fiber, and it was determined that the climatic and soil conditions of that region are favorable for abacá, that the plant is resistant to the common diseases of the banana, and that fiber of excellent quality can be produced in Panama. In 1937 and 1939 field plantings were made, and these plantings are now being extended both in Panama and in Costa Rica.

Although there is little doubt that the abacá plant can be grown in the American Tropics in places having suitable climatic and soil conditions, the cleaning and processing problems are not yet entirely solved. It is questionable if the production of abacá fiber anywhere in the Western Hemisphere either by hand-stripping or by the small machine method of cleaning will be a profitable business undertaking, and the use of the large fiber-cleaning machines requires big acreages and heavy capital expenditure. Except for experimental plantings, it is regarded as advisable for the present to confine the expansion of the abacá industry in the Western Hemisphere to the regions in which commercial plantings are now being made.

The combination of strength and water resistance makes abacá the most valuable fiber for the production of naval and marine cordage, and it is thus a raw material of prime importance in wartime. A few small shipments of abacá from Panama to the United States have been made, but since about 18 months must elapse before new plantings mature, it will be some little time before substantial relief of the abacá situation can be expected from Latin America. For the present, stocks are being rigidly conserved and substitutes are being sought. One of the most promising substitutes is the soft fiber, ordinary hemp, which is described on page 107.

Henequén and sisal are ordinarily considered together, since both are imported into the United States under the one trade name of "sisal," despite the fact that they come from two distinct species of plants that require for their

Courtesy of Pan American Airways.

Two of the most important hard fibers grown commercially in the Americas are sisal and henequén. The picture at the left is of sisal growing in Haiti; at the right, henequén drying in Mexico.

best development different climatic and soil conditions. Henequén is produced in Mexico and Cuba by the plant *Agave fourcroydes;* sisal, in the Netherlands Indies, East Africa, Haiti, and the Bahama Islands by the *Agave sisalana.* The fibers are similar in appearance and quality, but they are by no means identical and their uses are somewhat different. It would be of advantage to both producers and users if the two fibers could be known by the distinctive trade names, henequén and sisal.

Both henequén and sisal are native to Mexico and were being used by the Aztecs and Mayas when Cortez invaded that area in the sixteenth century. The primitive methods originally used for cleaning the fibers were slow and tedious, but about 1830 a simple cleaning machine was invented and its use led to a gradual expansion of the industry. The two plants were introduced from Campeche, Mexico, to Coconut Grove, Florida, about 1834, and from Florida sisal has been distributed to many different countries.

At present henequén is cultivated for the commercial production of fiber only in Mexico and Cuba. The principal sisal-producing countries are the Netherlands Indies and the East African colonies of Britain and Portugal, with Haiti contributing a relatively small portion of the world supply. There is a small production in El Salvador from the plant *Agave letonae* of a fiber similar to henequén and known to the trade as Salvador sisal. All these Latin American sources have customarily supplied 50 percent or a little more of annual United States imports of sisal and henequén combined.

Henequén is a hardy slow-growing plant that can be cultivated in regions where climatic and soil conditions are unsuitable for practically any other cultivated crop. Mexican production centers in the rugged State of Yucatán, where the plant flourishes on rocky limestone soil and the only cultivation the fields receive is an occasional clearing of brush and weeds. The plants come into production 5 to 7 years after the suckers are set out and continue to produce for a period ranging from 10 to 20 years. Because of a heavier rainfall and somewhat more favorable soil conditions, the henequén plant matures more quickly in Cuba but lives for a shorter period of time.

The sisal plant yields its first crop of leaves about 3 years after the suckers are planted and continues in production from 5 to 7 years. Sisal is ordinarily grown in regions having a fairly heavy rainfall, frequently on fertile soils, and the fields are usually cultivated.

Both of these fibers are cleaned with large automatic machines which scrape away the pulp and waste material, leaving the clean fiber. After leaving the cleaning machines, the fiber is dried either in the sun or in mechanical dryers and the superior grades are usually brushed before being baled for market. The United

States is the principal market for Mexican and Cuban henequén, and the fiber is used mainly for the manufacture of binder twine. Large quantities of henequén fiber are consumed locally in Yucatán for the manufacture of twines, cordage, and sacks. The more important uses of sisal are for binder twine and miscellaneous cordage purposes, but this fiber is also used for mattress pads, floor mats, and porch furniture.

Before the outbreak of the war, total world production of henequén and sisal was rather more than adequate to supply requirements, and efforts were being made to curtail production and to develop new industrial uses for the fibers. This situation has been drastically altered by decreased production in the Far East and interference with shipping facilities, and now emphasis is on increased production in the Western Hemisphere. There are opportunities for an extension of acreage in all of the countries where these fibers are now produced, and reports from the south indicate that steps in that direction have already been taken. Although it is impossible to determine at this time how long the emergency will continue or what the fiber situation will be after the war, the tropical American republics should have little hesitancy in increasing their production of sisal and possibly of henequén.

The Soft Fibers

Jute may well be regarded as the world's most important soft fiber, even though it is inferior in quality to flax and hemp, for it is consumed in larger quantities than all the other plant fibers combined, omitting cotton. Produced in large commercial quantities in but one country, India, it is used throughout the civilized world. There are many acceptable substitutes, but it has not been possible to produce any of them at a cost that would enable them to compete successfully with jute.

In a fairly compact area, principally in the Province of Bengal, and on a large number of small farms, some two million tons of jute fiber are produced annually in India. Jute farmers ordinarily do not cultivate more than 3 acres, and all members of the family participate in the operations. With climatic and soil conditions that are exceptionally favorable for this crop, with adequate facilities for separating the fiber, and with labor costs reduced to a minimum, it has been possible to produce jute more cheaply in India than in any other part of the world. Large sums of money have been expended in the effort to perfect machines for cleaning jute fiber, but no machine has yet been obtained that can compete with the cheap labor of the Indian *ryot* or peasant.

Jute is used for many different purposes, but the most important is the manufacture of burlap and other types of coarse fabrics. From these fabrics are made the hundreds of millions of bags and sacks that are used for packaging both agricultural and manufactured products. The total elimination of the supply of jute bags would require a general reorganization of the present methods of handling and transporting many of the world's most important raw materials. The American republics import burlap bags in much larger quantities than they do jute itself.

Experimental plantings of jute have been made in different countries in the Americas, and in several instances there has been a small commercial production of this fiber. Ultimately, however, it has been found in each one of these projects that jute could be imported from India more cheaply than it could be produced. There are many places in the Western Hemisphere where conditions are reasonably favorable for the cultivation of this crop, but until machines for cleaning the fiber have been perfected it is unlikely that there will be any large production of jute in the American tropics. So long as Eastern sources are unavailable, substitutes of higher quality and cost are going to have to be used.

Fiber flax, used in the production of linen thread, fabrics, fish lines and other textile articles requiring both fineness and strength, is a temperate zone product. It is grown in cool moist regions of many countries, but large-scale production in recent years has been confined largely to the Eastern Hemisphere, with Russia as much the largest producer. The seed flax plant, widely grown in Argentina, Canada, and the United States for linseed-oil production, yields a fiber that is used as a paper material but is not suitable for spinning.

The strands of fiber in the flax plant lie between the outer skin of the stem and the woody pith forming the center. To separate them, the straw is first retted (permitted to rot) in water. It is then dried, and passed through rollers which break the core into small pieces. The broken straw is subjected to a process called scutching, in which it is beaten with special blades that remove the broken woody portions and outer skin. In the linen mill, the scutched flax is hackled (combed) to remove the short fibers, known as tow, which has important uses but sells for somewhat lower prices than the longer strands called line fiber. Until recent years, a large amount of hand labor was required in this cleaning operation, but machinery has now been perfected for doing much of the work.

The Western Hemisphere normally produces only a small percentage of its flax fiber needs. The United States has a small industry and has approximately doubled its acreage in the last couple of years. Peru has made marked progress in developing its fiber flax industry in the last two years, and several other American countries, notably Argentina and Chile, have begun to produce small quantities. The fiber flax plant is rather exacting in its climatic and soil requirements, and specialized knowledge is required both in growing the crop and

Courtesy United Fruit Co.

The Far East has been the chief source of abacá and kapok fiber, but the Americas have begun to grow them. At the left, an abacá plant in Panama; right, a kapok nursery in Guatemala.

processing the fiber. In view of increased wartime demand for the fiber and of the improvements that have been made in producing and processing methods, an increasing production of fiber flax in the Western Hemisphere seems likely.

Hemp may prove to be the Cinderella of the fiber world. Not many years ago hemp production was a substantial agricultural industry in the United States, particularly in the State of Kentucky, and the fiber was extensively used in rope manufacture. Then abacá was introduced, and the domestic fiber dropped into a secondary position. Today, with imports of abacá and jute curtailed, there is renewed interest in hemp, which can be substituted to some extent for both of them.

The name, hemp, is applied in the trade to so many different products that it has become almost a synonym for fiber. There is, however, only one true hemp, a soft or bast fiber produced by the plant *Cannabis sativa*. It is more nearly like flax than any other commercial fiber, is removed from the plant by retting, breaking and scutching, and may be hackled so as to be as fine as the coarser grades of flax. The principal use in recent years has been for the manufacture of twines and certain types of marine cordage. Hemp tow is used extensively in the manufacture of oakum. The plant requires a temperate climate, annual rainfall of at least 30 or 35 inches, and a fertile loam soil.

Like flax, hemp is grown to some extent in practically every temperate zone country, but by far the larger part of the world supply has been produced in the Eastern Hemisphere. Total world production in recent years has ranged from 275,000 to 350,000 tons a year, produced principally in Russia and Italy. The United States has been using only between 1,000 and 1,500 tons a year, about half of it produced domestically and the rest imported, chiefly from Italy.

Like the United States, Chile and Argentina produce small quantities of hemp fiber, and all three countries are prepared to produce more. The United States is aiming at doubling its acreage of hemp for fiber in 1942 and has launched a program for increased seed production. In addition to the countries mentioned, there are other regions in the Americas where conditions are favorable for hemp production. Farmers who have had experience with the crop like to grow it, since it clears the land of weeds and improves the physical condition of the soil. Machinery for cleaning the fiber is available and markets are well established.

As a substitute for abacá in the manufacture of marine cordage, hemp yields a product of somewhat less strength and water resistance but of fairly satisfactory properties in an emergency. The tow can be used to produce bagging ordinarily made from jute, although at a somewhat higher cost. Under these circumstances, there seems to

be little doubt of a largely increased consumption of hemp during the war period provided supplies are made available.

Kapok, the Seed-pod Fiber

The kapok plant, an American native that is supposed to have been taken to the Far East by the early Portuguese navigators, is now widely distributed throughout the tropical regions of the Orient. The plant still grows in the wild state in nearly all parts of the American tropics, but the commercial production of kapok fiber is mainly in the Netherlands Indies. Although kapok is cultivated as a plantation crop in Java and Sumatra, approximately 90 percent of the total production in the Indies is obtained from trees growing along roadsides and around the houses of the native people.

Perhaps the principal reason why there has been a relatively large development of this industry in Java is the fact that the production of kapok requires a large amount of hand labor. The pods must be gathered, one at a time, from the large trees on which they grow, and after being dried, the down and seeds are removed, also by hand labor, from the pods. Formerly the fiber was cleaned by hand labor, but the superior grades are now cleaned with machines.

With the elimination, at least for the time being, of the main source of supply of kapok fiber, there is an unusual opportunity for developing the production of this fiber in the Americas. Ecuador already has a fairly large production of kapok, and several different species of the *Ceiba* trees, which produce the fiber, are distributed throughout the American tropics. It is questionable if the production of kapok will ever become an important plantation industry in any of the American countries, but there are many places where this fiber could be made the basis of a household industry.

The more important uses of kapok are for the manufacturing of life-saving apparatus, for insulation purposes, and as a stuffing and filling material. The consumption of this fiber is increasing, and it is probable that new uses would be discovered if larger supplies were readily available.

Substitute Fibers

An unusual amount of attention is now being given to some of the so-called "new" fibers, which may perhaps be used as substitutes for products of which there is an actual or a prospective shortage. Under normal conditions of world industry, the introduction of new fibers is ordinarily rather difficult. Manufacturing machinery has been perfected for handling the fibers that have long been in general use, and markets have been developed for the products made from them. The manufacturers of textile fabrics, cordage, and other products made from the plant fibers are usually disinclined to use new raw materials without definite assurance that these new materials are either cheaper in price or superior in quality to the materials that have formerly been used. It is also required that regular supplies of the new fibers shall be available in commercial quantities, and that they shall be of uniform and standard quality. In other words, it is difficult to establish production of the raw materials on a commercial basis until there is definite assurance of a market, and it is difficult to establish a market until there is assurance of production in commercial quantities.

An emergency time like the present furnishes favorable conditions for the introduction of new fibers, but the producers of these fibers should clearly understand that when the emergency is over they must be prepared to compete both in price and in quality with the fibers that have formerly been used. The development of a new industry on the basis of war prices is ordinarily neither a substantial nor a profitable undertaking.

There are several plant fibers that are used in fairly large quantities in the countries where they are produced and that have an established, though minor, position in the export trade. It should be possible to develop the use of these fibers as substitute materials. Included in this group are palma istle, produced in Mexico, and used both for cordage and fabric purposes; caroá, which is produced in Brazil and is also used for fabrics and for cordage; and ramie, which is grown in small quantities in several Latin American countries and is primarily a textile fiber.

A second group includes fibers that have a local use, and that could probably be used as substitute materials if available in larger quantities. Ordinarily these fibers are produced, either entirely or in part, from wild plants, and are cleaned by hand methods or by small and crude machines. Under these conditions of production, the available supplies are likely to be irregular, and the quality may not be entirely satisfactory. Promising representatives of this group are the pita floja and fique fibers of Colombia, and the soft fibers produced by many different plants of the Malva group, which are widely distributed throughout the American tropics.

These, and perhaps a number of other plant fibers, are worthy of attention at this time. The increased production of any of these fibers will furnish material for which there is now urgent need, and current prices for all fibers should serve to stimulate their production. As the new fibers become better known to the manufacturers and as improvements are made in the present methods of cleaning and processing, it is not unlikely that the production of some of these fibers may be established on a permanent and profitable basis.

North of the Border

Big Canada, rich in agricultural and industrial products, has long enjoyed cordial relations with the American Republics, and today is contributing heavily from its resources to the war effort of the Western Hemisphere and all the United Nations.

by JOHN L. STEWART

The Good Neighbor policy extends not only south of the Rio Grande but north to the Dominion of Canada, an enterprising and resource-filled nation that is making large contributions to the war effort of the Western Hemisphere. As a member of the British Commonwealth of Nations, the Dominion has quite logically geared its economic development in large measure to fit the commercial policy of the Empire. Similarities in economic and political development, however, have long provided the basis for sympathetic collaboration with the American republics.

Modern Canada dates from the passage in 1867 of the British North American Act, offering to all the British colonies in North America an opportunity to confederate as the Dominion of Canada. The province formerly known as Canada, lying directly north of the Great Lakes, was divided to form the provinces of Ontario and Quebec, where 60 percent of the country's population lives. Nova Scotia and New Brunswick were the other two original members of the confederation. Gradually the other North American territories entered the fold. Manitoba joined in 1870; British Columbia, in 1871; Prince Edward Island, in 1873; and Alberta and Saskatchewan, in 1905. In addition to these nine provinces, the Dominion includes the Yukon Territory, which adjoins Alaska and was organized in 1898, and the Northwest Territories, a vast reach of forest, mountains and lakes extending from the provinces northward for hundreds of miles beyond the Arctic Circle.

The Act establishing the Dominion paved the way for its virtually complete independence, which has now been attained. Canada is linked with the other British Commonwealth nations by allegiance to the King of England and is obligated to consult with the others in such matters of foreign policy as war, peace, and neutrality, but the Dominion Government in Ottawa may be regarded as otherwise fully sovereign.

Geographically Canada is the Gargantua of the Western Hemisphere family of nations, with an area of 3,500,000 square miles, slightly greater than that of Brazil and a sixth larger than the United States. It is even more sparsely populated than most of the South American countries, containing only 11,000,000 people, most of whom live within 300 miles of the United States. Canada's population density is only about 3 persons per square mile, compared with 43 in this country.

Agriculture employs more people than any other single Canadian industry. In value of total output, farming runs a strong second to manufacturing for the country as a whole and predominates in the western provinces. The net value of production of all types of enterprise for 1938 in the nine provinces and Yukon Territory was nearly three billion dollars. Manufactures accounted for almost 40 percent of that total, and agriculture for about 25 percent. While industrial production is the leader in Ontario and Quebec, the net value of the agricultural output of those two provinces together was larger in 1938 than in all other provinces combined. Livestock, dairy products, tobacco, and fruit are leading agricultural items in the two central provinces. In the prairie provinces of the west, where agriculture accounts for 42 to 72 percent of the net value of production, wheat and livestock are the big items.

Unlike United States farmers, Canadians lack an extensive domestic market and have always depended heavily on exports. Wheat from the prairie provinces has been the traditional export crop. Pork products, with the output centering in Ontario, and live cattle from Ontario and the western provinces also have long export records. In more recent years, dairy products from Ontario and Quebec, fruit from British Columbia and Nova Scotia and tobacco from Ontario have become prominent in foreign trade.

The first World War stimulated Canadian agricultural output strongly. The first phase occurred during the war, when farmers were asked to produce to the limit

The Author

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for the Allies. Wheat production was stressed especially, and new areas of prairie land were brought under cultivation. After the war, allotments of land were made in the various parts of the Dominion to demobilized soldiers. Grants made in the prairie country added to the wheat producing capacity. In other areas, such as the Okanagan Valley of British Columbia, relatively new lines of production were opened. British Columbia became noted for its apples, peaches, pears, apricots, prunes, and other fruit. In Ontario, and to a smaller extent in Quebec, tobacco production dates practically from the end of the last war.

Most of Canada's politieal and trade relationships within the Western Hemisphere have naturally been with its closest Americen neighbor, the United States, and generally speaking these have been conducted with relatively little friction over a long period of years. Final settlement of the international boundary early in the last century removed the basis for territorial disputes and laid the groundwork for a flow of trade which showed a generally upward trend until the depression of the 1930's. Then low prices and the resulting protective tariff policies throughout the world reduced the volume and value of commerce among practically all countries. One of the fundamental purposes of the Good Neighbor policy is to restore wholesome inter-American trade, not only among the 21 republics but between the republics and Canada.

Two Similar Economies

In some respects, similarity of economic development has hindered the effort to create closer commercial relations between the United States and Canada. Agriculture in both countries expanded during the last century to meet the demands of a growing export market. Development of the western railways opened up the prairie lands to settlers and added to the national productive capacity. European requirements for North American grain, livestock products, and fruit, already very large before the first World War, were increased for nearly 10 years thereafter. Then came the urge for European agricultural self-sufficiency and a drastic cut in the demand for North American farm products. Competition between United States and Canadian farmers for larger shares in the shrinking overseas markets pointed up sharply the similarities in the national economies of the two countries. From the viewpoint of the United States, this similarity was made even more noticeable by the broadening of the preferential trade policy of British countries favoring Empire goods against goods of non-Empire origin.

Despite this competition in the export market, there were relatively few hindrances to the direct agricultural trade between the United States and Canada before 1930. United States fruit (chiefly citrus) and fresh vegetables, leaf tobacco, cotton, eggs, and other items moved to Canada in large volume. The leading Canadian agricultural products reaching United States markets were live cattle, cheese, potatoes, fresh pork, poultry, grains and grain products, and various forage plant seeds. In a period of generally high prices, each country absorbed the products of the other with all of the attendant advantages of trading in substantial volume. Depression, low prices and trade barriers, however, reduced that formerly profitable exchange of commodities to very low levels for most of the 1930's.

The United States-Canadian trade agreement of 1936 was the first real effort of recent years to bring about closer agricultural economic relations between the two countries. The agreement made moderate reductions in duties on agricultural products, and these contributed to the upturn in trade that had already begun to develop as the world emerged from economic depression. After nearly three years of favorable results, the much more comprehensive agreement of 1939 was negotiated in which both countries lowered their trade barriers still further. When Canada entered the war late in 1939, everything possible was done to prevent war conditions from interfering with the trade expansion taking place under the agreement, and efforts have met with considerable success.

Although Canada depends on Cuba for around three-fourths of its sugar requirements, it has never had a very large trade with any of the other Latin American countries, since both areas found their principal export outlets in Europe. The war is bringing about a change in this situation. From 1939 to 1940, the volume of trade between Canada and Latin America more than doubled, and there was a further increase in 1941. The percentage increase in trade with some of the countries was startling. Canadian imports from the Dominican Republic, for instance, increased from $17,000 in 1939 to $3,792,000 in 1940, a gain of 22,000 percent.

During 1941, a Canadian Trade Mission was dispatched to Latin America in an effort to stimulate trade with the republics south of the Rio Grande. The group traveled as far south as Panama and signed commercial agreements with a number of countries. A further evidence of Canada's willingness to play a larger role in inter-American affairs is the fact that in the last couple of years diplomatic representatives have been exchanged with Argentina, Brazil, and Chile.

One of Canada's leading roles in the war effort of the Americas and the other United Nations is as a supplier of food. Fortunately, the Dominion is much better rehearsed for the role now than it was at the beginning of World War I. For example, the area devoted to wheat in 1939 was about 28,000,000 acres against 17,000,000 acres in 1918 and 10,000,000 acres in 1914. The

hog census at the beginning of 1939 was almost the same as at the end of 1918, but during the single year 1939 the increase in hog numbers was equal to the total increase in the four years of the last war.

Since Canada and the United States are closer to the United Kingdom than are other major agricultural exporting countries, it became evident early in the current war that heavy demands would be made upon North America to provision the British war effort. Britain is now drawing from Canada much larger quantities than usual of cured pork, dairy products and flax fiber. Some fruit and tobacco have moved to Britain from Canada, too, but those items are more likely to represent problems in surplus disposal than problems in supply.

British war requirements for cured pork have brought Canadian hog production up to record levels. Under a series of agreements between the British and Canadian Governments, minimum annual quotas have been supplied at fixed prices for the several grades. The Canadian authorities, in turn, have established price ceilings for pork products, hogs, and feedstuffs at levels calculated to bring forth the volume of production required.

Feed, Seed, and Starch

In addition to its food supply role, Canada is in a position to supplement Latin America as a United Nations source of a number of war products, which the other Americas also produce but cannot export in as large quantities as is desirable because of the shipping shortage. Among these are livestock feed and oil-bearing seeds. Under a recently announced arrangement, which indicates a considerable change in traditional habits of thought regarding competitive products, Canada and the United States will grow additional oil-bearing seeds to meet the common needs of the two countries in their war effort.

Feed grains produced under the arrangement will help both Canada and the United States to maintain livestock production, which they are stressing heavily during the war years in order to continue abundant supplies of meat, fat and dairy products for overseas shipment as well as for domestic consumption. This should be of great assistance to livestock producers, particularly since the demands of war upon shipping facilities hinder considerably the North American use of South America's feed grain surpluses.

Restricted shipping facilities are also an important factor in the program for an increased output of oilseeds in North America. Both the United States and Canada have undertaken to increase the acreage devoted to flaxseed for oil extraction. Climatic conditions limit the Canadian production of other oil-bearing crops, thus placing an additional burden upon the United States where an effort is under way to reach higher production goals for soybeans, peanuts, castor beans, and other oil-bearing materials. Here again the utilization of larger quantities from our friends to the south would be highly desirable, but the hazards of the sea lanes and the demand for the ships along the routes of military supply dictate a policy of greater reliance upon North American productive capacity.

The problem of starch supply also is common to both the United States and Canada. The United States has made heavy imports of tapioca starch in pre-war years from the East Indies. Canada has imported corn for starchmaking from South Africa. Today supplies from those sources are virtually unobtainable, and again the dearth of shipping prevents full use of the abundant supplies of those products the other American republics would be glad to export. This throws the burden of the starch supply upon the North American corn crop and to a minor degree upon potatoes, which yield a starch that for many industrial uses is the only satisfactory alternative for tapioca starch.

The differences in price levels for agricultural products that exist between the United States and Canada do not make it any easier to harmonize the agricultural economies of the two countries for the most effective war effort. Generally speaking, agricultural prices of the United States have reached a level somewhat higher than prices prevailing in Canada. This has resulted in a twofold problem: (1) The danger that Canadian supplies may be reduced seriously through excessive exports to the United States; and (2) the difficulty of importing into Canada needed products which must be sold under the general Canadian price ceiling.

Solution of the problems indicated has been undertaken by Canada through: (1) Drastic limitation of exports; and (2) the subsidizing of needed imports so that they may be sold within the price ranges established for Canadian products. The long list of Canadian products that can be exported only under license includes beef, pork, seeds, dairy products, and many other agricultural items.

A willingness, both official and unofficial, to attempt the most effective utilization of the agricultural resources in both the United States and Canada has been the outstanding development of the wartime relation between the two countries. It is becoming increasingly apparent that North America must be the source of a very large fraction of the food supplies of those nations actively engaged in warfare with the Axis countries. It is evident, therefore, that without losing sight of hemispheric interests in a larger sense, so long as a tight shipping situation exists, it is necessary to plan for the most efficient utilization of agricultural production in the United States and Canada. The job of supplying the United Nations is uniting North America.

The Palace of Fine Arts in Mexico City, where delegates from all the Americas will gather July 6 to 16 for the Second Inter-American Conference of Agriculture. Sessions will be open to visitors.

The Mexico City Conference

by JOSÉ L. COLOM, Pan American Union

Modern warfare has demonstrated that the course of a campaign often depends upon the ability of opposing nations to produce and distribute the necessary foodstuffs. That is why inter-American agricultural relations are becoming progressively more realistic and more far-reaching in their effect on world events. At every opportunity stress is being placed upon the importance of coordinated agricultural production in a war society.

The Second Inter-American Conference of Agriculture, to be held in Mexico City July 6 to 16 under the auspices of the Mexican Government, is a forceful example of this shift and intensification of inter-American interest. The Conference, although called before the entrance of the United States into the war, has quickly and effectively adapted its program to consider problems brought about by the present war, as well as questions of agricultural technology.

The program gives implicit recognition to the fact that the Western Hemisphere today is the chief production area of the United Nations. The northern section is mainly concerned with industrial production of war machinery and the southern part is rapidly becoming a major source of tropical and subtropical agricultural commodities necessary to wage a successful war. Specific emphasis is given on the one hand to industrial crops, including rubber, cotton, and insecticidal, oil, fiber, and medicinal plants, and on the other hand to such important staples as coffee, cacao, and grains. The program does not limit the assembly to present-day considerations; it recognizes that planning for agricultural production and readjustment after hostilities end should be done now, on a long-term basis, to fit into a total program of postwar reconstruction.

The Conference will give practical expression to many of the resolutions approved at the Third Meeting of the Ministers of Foreign Affairs of the American Republics, held in Rio de Janeiro in January of this year. It will demonstrate the power of the American republics to apply their entire strength and resources to the development of an adequate program of hemispheric defense.

The 1942 Conference will meet under world conditions somewhat different from those that accompanied its predecessor, for the First Inter-American Conference of Agriculture occurred in Washington, D. C., in September of 1930, when the Western Hemisphere was warring against world depression rather than against a formidable military machine. There were 54 official delegates and many more consulting delegates and they were in session for almost two weeks. Every republic was represented, with country delegations ranging from one representative to 14.

If this summer's session can surpass that first conference in foresight, it will have done well, for the Washington Conference, while leaning toward technical problems in its discussions, included in its final act a number of suggestions that might have been drafted yesterday, so pertinent are they to the current situation. The delegates, for example, strongly urged crop diversification as a means of improving agricultural economy and suggested international action to deal with overproduction of sugar, coffee, cereals, cotton, and meats. They recommended creation of a Pan American agricultural bank to further agricultural credit; rehabilitation of the declining cacao industry in the Western Hemisphere; an improvement in agricultural statistics, and the stationing of agricultural attachés at more of the diplomatic missions in the Americas as a means of strengthening hemispheric economic ties.

One of the resolutions of the Washington meeting proposed that the Second Inter-American Conference of Agriculture be held in Mexico City. After a lapse of 12 years, marked by many inter-American meetings at which agriculture was discussed but by none at which it was the principal topic, that second meeting is now to be held. Originally it was scheduled for October of 1942, but when 10 of the American republics were drawn into the war and agricultural production problems became more urgent, the date was advanced.

The Government of Mexico extended the invitations and named as chairman of the organizing committee its Secretary of Agriculture, Ing. Marte R. Gómez (see page 119, this issue). All the American republics were asked to suggest topics for consideration. Their response was generous and from the subjects proposed a tentative agenda was drawn up by the agricultural commission of the Pan American Union's Governing Board. This is the basis of the papers and reports that will be submitted under a schedule to be worked out when the Conference convenes.

On matters requiring formal action, each country will have one vote, to be cast by a group of official delegates designated by its government. From each republic, too, will come somewhat larger groups of consulting delegates, expressly invited by the organizing committee. Because of the wartime transportation difficulties, delegations are being kept relatively small. President Manuel Avila Camacho of Mexico will officially open the Conference, and Secretary Gómez will lead the host country's delegates. It is expected that Secretary of Agriculture Claude R. Wickard will head the United States group.

Active in planning the Mexico City Conference were (left to right) Dr. Leo S. Rowe, Director General, Pan American Union; Ing. Marte R. Gómez, Secretary of Agriculture of Mexico; Pedro de Alba, Assistant Director, Pan American Union; and Ing. César Martino, manager of the National Agricultural Credit Bank of Mexico.

The Mexico City Conference is a conspicuous example of inter-American agricultural cooperation, which is in turn an outstanding demonstration of practical Pan Americanism—practical because it is based on economic considerations that mean life, security and happiness to millions of people; Pan American because it involves the voluntary participation of the 21 American republics, each of which can learn from its neighbors. Each region needs products from the others. Each has special problems of production and consumption, of deficits and surpluses, that must be considered in preparing an agro-economic plan of the Americas.

It is in this spirit of cooperation that the Second Inter-American Conference of Agriculture will convene to demonstrate that international teamwork can solve both the problems of the moment and those of the post-war world.

Latin America's Orchards

A capsule report on the fruit industry in Argentina, Brazil, Chile, and Mexico, plus a few observations about the effect of the war on growers in those countries and some indications as to the possibility of increased trade in fruit between the Americas.

by FRED A. MOTZ

Most people would like to forget the early 1930's, but the world fruit industry remembers that period as one of the most important in its history, for it was then that the Southern Hemisphere became a full-fledged member of the world fruit fraternity. Scandinavians suddenly found that they could afford to buy grapefruit. Amazed Londoners saw fruiterers' windows filled with moderately priced peaches in midwinter. To the delight of consumers throughout the world, apples, pears, grapes, oranges, and other fruits that previously could be had only during certain seasons became available almost every day of the year.

The development began with the wide interest in fruit production that resulted from high prices following the World War. It was stimulated by greatly improved methods in handling, transportation and shipping. First to become prominent among the "off-season" producers were the British Empire countries of South Africa, Australia, and New Zealand. In 1935, Latin America entered the field and with each passing year its products arrived in increasing quantities in world fruit markets to supplement supplies from the longer-established areas. Argentina, previously known more for its meat and wheat, and Chile, famed for its nitrate of soda, began to attract attention for their deciduous fruits. Brazil became recognized as an important supplier of citrus fruits, as well as of a large part of the world's coffee.

Then Came the War

By the time war broke out in the fall of 1939, fruit exports from these Latin American countries had reached significant proportions, and fruit production ranked among the leading agricultural industries. Today, however, as a result of the war, this industry is facing a rather uncertain future. A recent trip to the three countries mentioned and to Mexico afforded an opportunity to study their fruit production areas and methods and to make some observations about the relationship of the Latin American fruit industry to that of the United States.

Argentina is the most important producer of deciduous fruits in South America. About a third as large as the United States, the country has an abundance of fertile soil and an amiable climate and, while it is primarily a country of cattle and grain, its success in the cultivation of specialized crops, such as apples and pears, has been more than demonstrated.

Grapes and tree fruits in San Juan area, Argentina.

Because of its wide range of latitudes, Argentina is capable of growing practically all varieties and species of fruit. During the last 12 to 15 years commercial fruit growing has been developed in several widely-scattered zones, each with its own particular set of soil and climatic conditions. The fruits which enter world trade channels are produced in the irrigated sections of the country while that part of the crop which is sold on the local markets only is grown in the more humid parts of the country.

One of the prominent irrigated sections is the Rio Negro Valley, some 650 to 750 miles southwest of Buenos Aires. The profile of the country is similar in many respects to that of the arid and semi-arid regions in the western part of the United States. Small towns strung out along the valley resemble in appearance this country's frontier villages of 40 or 50 years ago, with their unpaved streets, adobe buildings and the familiar hitching racks for horses. This valley specializes in growing

apples and pears. The first commercial orchards were established 20 years ago and in 1928 plantings were undertaken on a large scale. In 1932 the valley shipped 135,000 boxes of apples and 200,000 boxes of pears. By 1939 shipments had increased to well over a million boxes of apples and more than 2 million boxes of pears. On the basis of tree population, acreage and past performance records, it is estimated that by 1945 Rio Negro's annual production will amount to almost 3 million boxes of apples, equivalent to Oregon's yearly crop, and 6½ million boxes of pears, somewhat more than the normal annual production of the State of Washington.

The Mendoza-San Juan region is also irrigated and produces fruit for the world market. It lies along the western boundary of Argentina at the base of the Andean range, the great mountain barrier that divides Argentina and Chile. In this area, the Andes tower to some of their greatest heights, culminating in the majestic peaks of Mount Aconcagua and Mount Tupungato, both of them well over 20,000 feet high. The steep, rugged eastern slopes, badly eroded by wind and rain, are practically nude of vegetation. Eastward from this forbidding barricade, at an elevation of about 2,000 feet, extends the flat country that supports the orchards and vineyards of Mendoza. By nature it is an arid wasteland, but it becomes an oasis when supplied with irrigation water from the melting snow of the slopes that lie above.

Mendoza is known as the vineyard of Argentina and is deserving of all the praise it has received for the quality of its grapes. The province also produces some excellent apples, pears, and stone fruits. Grapes and plums from this area are well regarded in both New York and London. San Rafael is the most important tree-fruit area in the region although excellent plums and peaches are produced in the vicinity of the city of Mendoza. The Province of San Juan, north of Mendoza, has a somewhat hotter and drier climate and less diversity of crops. Its

A fruit town in the Rio Negro Valley, Argentina.

cultivated area is devoted almost entirely to grapes and, while many wine grapes are grown, it is particularly noted for the excellence of its table varieties. There are some tree fruits, mostly apricots, but the industry is not of commercial importance.

Large quantities of deciduous fruits are also grown in the eastern part of Argentina in the province of Buenos Aires and in the delightful Paraná Delta, a group of islands that has been formed by the Paraná and Uruguay Rivers where they join to form the mighty River Plate. A visit to the area is like gliding through the inland waterways of the Florida Everglades or the Louisiana bayous and seeing the banks lined with fruit orchards. Because the delta is surrounded by water, it is free of sudden or extreme changes in temperature, and temperate-zone fruits are produced successfully along with subtropical species. Apples, pears, plums, and persimmons grow side-by-side with oranges and lemons in one happy horticultural family.

The Atlantic region near Buenos Aires is one of the more recently developed fruit areas of the country. Here, in what is primarily grain and cattle country, the orchards are much larger than is common in most parts of the country. While various kinds of fruits are produced, apples are by far the most important.

The varieties of fruit in Argentina are much the same as those grown in the United States, supplemented by varieties which are found in other Southern Hemisphere countries and which have proved popular on the European market.

As a fruit-producing nation, Argentina rose in 5 years from a place of obscurity to one of international importance. The Rio Negro and the Mendoza-San Juan districts have taken their place along with such other world-famed regions as the Santa Clara, Hood River, Yakima and Shenandoah Valleys of the United States. They have demonstrated their ability to produce fruit that has made a place for itself on the most

The Author

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Harvesting melons in the Llay-Llay Valley, Chile.

discriminating of world markets. When the free way of life is again established in the world, more will be heard from the fruit growers of Argentina.

After Argentina, Chile is the most important among the South American countries producing deciduous fruits, which grow profusely in the fertile Central Valley where the country's population and agriculture are concentrated. More than 70 percent of the land surface of Chile is mountainous, much of it standing almost on end, and 40 percent is so parched that even desert plants have difficulty in existing. The Central Valley, however, is one of the finest agricultural areas in the world. It has a benign climate, without extremes of heat and cold, plus abundant sunshine and water, and is hospitable to practically all the usual fruits of temperate and subtropical regions.

The commercial fruit industry of Chile is tucked away in small, scattered valleys throughout the length of this garden spot. Stone fruits and table grapes do best in the northern part, wine grapes and pears in the central section and apples in the south. Among the chief producing regions are the Llay-Llay Valley, nestled at the foot of towering mountains and famous for its luscious grapes and excellent honeydew melons; Los Angeles, which in Chile is known not for movie stars but for apple production; and the Aconcagua Valley, where from the crest of a great mountain barrier beautiful orchards of apricots, plums, and peaches may be seen stretching far into the distance. The quality of Chilean table grapes and melons and the excellence of its wine are particularly well known.

Like most of the other South American countries, Chile is heavily dependent on exports for national prosperity, and before the war fruit exports represented approximately one-tenth of total shipments of agricultural products. About half the annual apple crop was shipped abroad, chiefly to Germany, France, and other continental European markets, and grapes, honeydew melons, and small quantities of stone fruits were exported to England and the United States. While exports were low in volume, compared to those of Argentina or the United States, they were important to Chile, and their loss as a result of the war has been a serious blow to the country's fruit growers.

Chile is endowed with many natural advantages in agriculture and seems able to produce fruit capable of withstanding competition on any market. The fruit industry could be expanded considerably, although such obstacles as lack of markets and capital and low domestic purchasing power are not easily overcome.

Brazil is a land of almost unlimited possibilities in fruit production as in nearly every other type of agriculture. The problem is not to make things grow but to keep one step ahead of the lush wild growth of the jungle. Fruits and nuts of all types grow or can be grown in the country, which has the full climatic range from equatorial to temperate.

The pineapple is native to Brazil, and the present commercial varieties have been developed from its wild species. Bananas and citrus fruits are produced over a wide area and form an important part of the diet. Apples, pears, quinces, and stone fruits are found in many gardens and small home orchards in the southern States of Rio de Janeiro, Minas Geraes, São Paulo, Santa Catherina, Paraná, and Rio Grande do Sul, but development on a commercial scale has not yet been attempted.

It would be a mistake to underestimate the fruit production possibilities of Brazil, for the *Brasileiros* are making rapid strides in the preparation of fruit for market. In normal times a surplus of more than 5 million boxes of citrus fruit was exported to Argentina and Europe annually, and oranges ordinarily rank among the country's half-dozen leading agricultural exports. Deciduous fruits could be produced with equal success in properly selected areas, if market conditions should ever warrant it.

Fruit of one kind or another is grown in every one of the 26 States of Mexico, which, although less than a fourth as large as Brazil, is even more startling in its climatic contrasts. There is, in fact, probably no other country in the world in which it is possible to see in such a short space of time the influence of varied climatic conditions upon vegetation and upon the life of the people. Tropical and subtropical fruits are produced in abundance along the coastal plains and in the lower mountain regions of Mexico. Temperate zone fruits grow in the higher elevations but in much less abundant quantities.

Commercial fruit growing is generally regarded as a highly specialized industry, but in Mexico cultural, packing and marketing methods are not yet well developed. Orchards are kept relatively clean and free of grass but, in the case of deciduous fruits, this is done more to make possible the inter-planting of other crops than for the benefit of the trees. Aside from this, not much plant

Oxen hauling newly harvested oranges in Brazil.

culture is practiced. There is little or no spraying or pruning. Harvesting operations and handling methods are rough by the standards of the major fruit producing countries. Instead of being graded or packaged, practically all fruits are shipped in bulk and sold on the basis of orchard run.

Under the circumstances, it is not surprising that Mexican deciduous fruits are scarcely comparable with similar fruits produced in Argentina, Chile, and the United States. Lacking in quality, color, and finish, they have no chance in the highly competitive world fruit market, and Mexico's only export fruits are bananas, pineapples, and limes. This is not to say that Mexico could not produce fruit of good quality, for the soil is fertile and the climate kind. Even in the arid districts, plants grow luxuriantly if supplied with water. A little more effort and a little more inducement might considerably alter the present situation.

Inter-American Fruit Trade

No one country enjoyed a monopoly of fruit markets during peacetime, and all fruit producing nations share in wartime difficulties. In Latin America, particularly, trade dislocations caused by the war have introduced serious and complicated problems to growers and shippers of fruit. There is probably no complete solution to these problems while the war continues, but even in the emergency the situation may be eased by an increased inter-American trade in fruits. The present may be a logical time for a reexamination of some of the policies that have been followed of recent years in both the Americas. Policies of uncontrolled exports and restricted imports, unduly severe quarantine regulations, rigid exchange controls and prohibitive tariffs in restraint of trade have little place in the world today, when the Western Hemisphere's way of life is under Axis fire.

The problems of the Argentine fruit grower, for instance, are not dissimilar to those of his fellow-farmer in the United States. The Argentine crop is harvested at a season opposite to that in this country and, while the marketing periods overlap to some extent and the United States is in no position to take the full impact of the Argentine export surplus, there should be no lack of willingness in this country to continue to take a limited amount, provided volume and shipments are regulated so as not to interfere seriously with domestic marketing programs. A move in this direction was made in the recent Argentine-United States trade agreement, when tariff concessions were made on pears, grapes, and prunes.

As another instance, more liberal trade policies might result in an increase in the fruit and vegetable trade between Mexico and the United States. The import duty on fruit shipped into Mexico from the United States often equals and sometimes exceeds the invoice value of the fruit. The effect is to confine the use of United States fruit of varieties and grades not produced in Mexico to the high income group in that country. Exports from Mexico to the United States of such products as limes and certain vegetables are also restricted by uncertain and high export taxes levied against shipments leaving the country. These taxes, when added to the import duties levied in this country, tend to place the delivered cost of the imported articles beyond the reach of the mass of consumers, thus seriously hindering efforts to build up any substantial trade.

These are examples of some of the questions that confront the fruit industry of the Western Hemisphere. A little tolerance and a little willingness to make personal sacrifices may both relieve the emergency situation and pave the way for a permanent solution in the peace to come.

Loading oranges for shipment at Rio Verde, Mexico.

ALONG THE *Agricultural Front*

▲ Fiber Mission Goes to Latin America

In a move to relieve the Americas' threatened fiber shortage (discussed on pp. 103–108), the Board of Economic Warfare has sent a three-man mission to Latin America to obtain information on fiber supplies now available and to develop new fiber production projects. By the time it returns to the United States in mid-June the group will have visited Cuba, Haiti, Venezuela, Colombia, and El Salvador.

Composing the mission are Lynn H. Sumpter, engineer on the staff of the Office of Foreign Agricultural Relations, who has worked in sisal production in Haiti; Columbus Moise, New York manufacturer, experienced in the purchase and milling of both hard and soft fibers; and Milo A. Borges, New York lawyer of Puerto Rican birth, who has traveled widely in Latin America.

▲ Inter-American Division in Office of Education

The United States Office of Education has increased its activities in the inter-American field through the establishment of a Division of Inter-American Educational Relations under the direction of Dr. John C. Patterson.

An important part of the Office of Education's program is cooperation with the Department of State in arranging for exchange of professors, students and teachers between the United States and the other American republics. It also prepares and distributes material about Latin America through its Information Exchange and evaluates credits and extends assistance to students from the other republics through its Division of Comparative Education. The program also calls for the development of demonstration centers in inter-American education in a number of schools and colleges throughout the country.

▲ University of Texas Expands L. A. Studies

The Institute of Latin American Studies, inaugurated at the University of Texas in the summer session of 1940, has expanded its program to include a visiting professorship in a Latin American field of learning; post-doctoral research fellowships in Latin American studies; special lectures by Spanish-American educators, and exchange professorships.

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Caracas, the capital of Venezuela, was founded in 1567 by Diego de Losada, and its full name is Santiago de Leon de Caracas.

▲ U. S. and Haiti Sign Agricultural Agreements

Two measures directly affecting agriculture were covered in a series of agreements between the United States and Haiti reached during a recent visit to this country by President Elie Lescot of the Caribbean republic.

One agreement calls for the purchase by the Commodity Credit Corporation of Haiti's surplus cotton. The Corporation, a Department of Agriculture agency, agreed to buy the 1942 crop, the carry-over of previous crops and all future crops produced during the war within specified limitations of volume. Haiti agreed to take steps to restrict cotton production and to improve the quality and increase the staple length of its cotton in future years.

The second agricultural agreement calls for arrangements for the planting of some 24,000 more acres of sisal in Haiti, which is at present a minor source of this important hard fiber.

Other agreements reached at the same time call for active United States assistance in developing Haitian defenses, extension of credit by the Export-Import Bank for exchange purposes, and the sending of experts to Haiti for consultation on improving health and sanitation.

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Latin Americans smoke more than 350,000,000 cigarettes per day, which adds up to about 1,600 a year per person. This is well above North American consumption which averages 1,400 per year.

AGRICULTURE IN THE AMERICAS ROBERT H. INGRAM, EDITOR

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Marte R. Gómez

OUR MUTUAL FRIEND

The forthcoming Inter-American Conference of Agriculture in Mexico City (pp. 112 and 113) has brought into prominence the host country's Secretary of Agriculture, Ingeniero Marte R. Gómez, chairman of the organizing committee responsible for the event. Traveling through Mexico, the delegates will see many evidences of the progress that has been made under his direction in improving agriculture.

A native of the farming State of Tamaulipas in northeastern Mexico, Ing. Gómez has been closely associated with Mexican agriculture for 25 years. In 1917, immediately after his graduation from the National School of Agriculture in Mexico City, he became an engineer with the National Agrarian Commission. Five years later he was its assistant director, and ever since he has been teaching agriculture or dealing with problems of agrarian credit or speaking for the farmer at financial and economic congresses.

Some high spots of the Gómez career: Director of the National School of Agriculture, 1923–24; assistant manager of the National Bank of Agricultural Credit, 1926–28; member of the Federal Congress, 1928–34; delegate to the London Economic and Financial Congress, 1933; Minister to France and Austria, 1935–36; Governor of the State of Tamaulipas, 1937–40.

On December 1, 1940, Ing. Gómez was appointed Secretary of Agriculture of Mexico, a position in which he had previously served in 1929. He is also president of the administrative council of the National Bank of Ejidal Credit, of the National Bank of Agricultural Credit, and of the National Commission on Irrigation.

Under the guidance of Secretary Gómez, Mexico has launched an agricultural program so broad that it has been called "a new agrarian reform." Its goal, in the words of President Avila Camacho, is "the economic emancipation of the Mexican farmer," and it includes intensification of irrigation, soil conservation through crop rotation, increased crop production, encouragement of livestock, expansion of the system of farm-to-market roads, and adequate provision for agricultural credit.

Well versed in all phases of this program, Marte R. Gómez is symbolic of the new, vigorous spirit of agriculture in his homeland.

Names and News

(Continued from page 102)

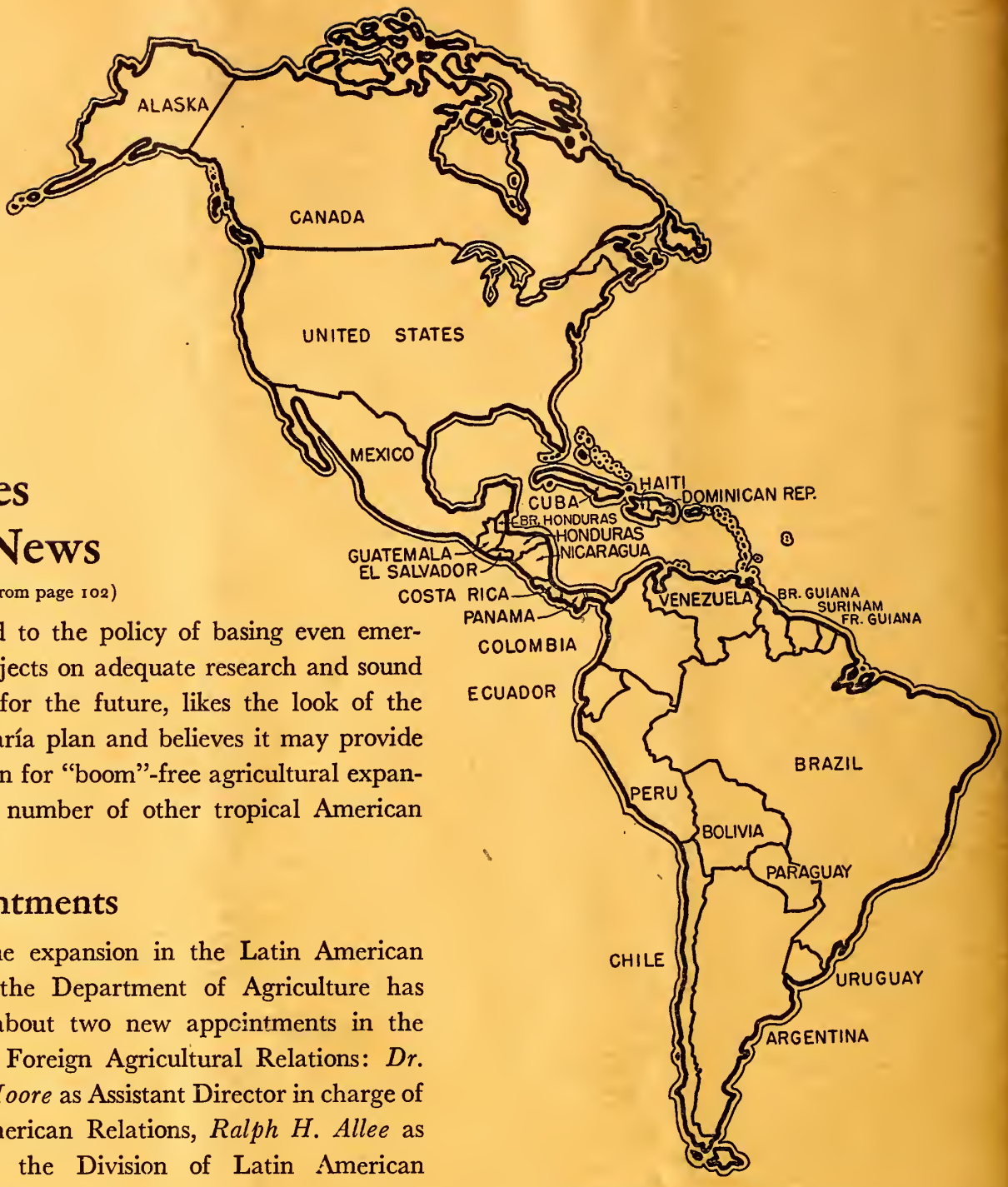
committed to the policy of basing even emergency projects on adequate research and sound planning for the future, likes the look of the Tingo María plan and believes it may provide the pattern for "boom"-free agricultural expansion in a number of other tropical American republics.

Appointments

Wartime expansion in the Latin American work of the Department of Agriculture has brought about two new appointments in the Office of Foreign Agricultural Relations: *Dr. Ross E. Moore* as Assistant Director in charge of Latin American Relations, *Ralph H. Allee* as Chief of the Division of Latin American Agriculture.

Dr. Moore, a native of North Dakota, is an engineer and soil scientist of 12 years experience in Latin America, has served on the faculty of the University of California and on the research staff of the U. S. D. A. Regional Salinity Laboratory in that State. He fills a position vacant since late 1941, when Dr. Earl N. Bressman joined the Office of the Coordinator of Inter-American Affairs.

Mr. Allee, a Californian with extensive experience in agricultural work abroad, headed the mission that inspected possible sites for the Inter-American Institute of Agricultural Sciences. He has been acting in charge of the Division of Latin American Agriculture for several months.



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IN THIS ISSUE

July 1942

Inter-American Cooperation in Agricultural Education

Conspicuous among the groups engaged in the strengthening of inter-American agricultural relations has been the Advisory Committee on Inter-American Cooperation in Agricultural Education. The following statement of the committee's organization, activities, and plans was prepared by its chairman, Knowles A. Ryerson, Assistant Dean of Agriculture at the University of California:

Recognizing the basic part that agriculture must play in any permanent program of inter-American cooperation and understanding, Henry A. Wallace, when Secretary of Agriculture, appointed a committee to work with the various Government agencies in formulating an effective program in the field of agricultural education and devising methods of carrying it out.

Soon afterward there came an expansion of inter-American activities throughout the Federal Government, and the committee became one of several comparable bodies appointed by the President to work through the Department of State. Designated as the Advisory Committee on Inter-American Cooperation in Agricultural Education, the group had its first meeting in November 1940 and has met twice a year since then.

(Note.—Committee members, in addition to Dean Ryerson, are: E. N. Bressman, Director, Agricultural Division, Office of the Coordinator of Inter-American Affairs; Thomas Barbour, Director, Museum of Comparative Zoology, Cambridge, Mass.; Homer J. Henney, Dean of Agriculture, Colorado State College; H. H. Hume, Dean of the College of Agriculture, University of Florida; Fred J. Kelly, Chief, Division of Higher Education, U. S. Office of Education; J. H. Lee, Dean of the College of Agriculture, University of Louisiana; and Charles A. Thompson, Chief, Division of Cultural Relations, Department of State.)

The committee's objective has been to work with the land-grant colleges and experiment stations in stimulating interest in agricultural problems common to all the Americas. As a basis for better agricultural understanding, the committee has recommended and urged increased teaching of historical, geographical, and economic backgrounds in all the republics, and an increase in the study of the written and spoken Spanish and Portuguese in this country, and of English in Latin America.

Recognizing that long-time development must be based on adequate training, the committee has endeavored to help increase the number of scholarships and fellowships available for the interchange of professors. Surveys of existing scholarships and fellowships are being made in cooperation with the United States Office of Education. This office was also asked by the committee to serve as a repository and information center for the various agricultural institutions of all the American countries and as an unofficial accrediting agency to assist in the evaluation of work presented by prospective students.

Because of the universal lack of trained personnel for tropical agriculture, as well as wholly inadequate research facilities in this field, much of the time of the committee has been devoted to plans for the establishment of the proposed Inter-American Institute of Agricultural Sciences. Attention has been given to the location, organization, and lines of work of this institution, which promises to be one of the most important contributions to hemispheric economic solidarity. The deficiencies in knowledge and personnel which the Institute is expected to help overcome have been highlighted by the war, which has

(Continued on page 140)

Agriculture IN THE *Americas*

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The Banana Circles the Globe

One of the most versatile food products of the tropics traveled from the Far East to the Western Hemisphere and became a principal item of trade between Latin America and the United States. Today, the shipping shortage is a threat to the banana industry.

by PAUL G. MINNEMAN

The banana is possibly the world's oldest cultivated crop. It was mentioned in Chinese writings of more than 3,000 years ago and was probably one of the first foods of primitive man. The ancients called it "fruit of the wise men" in recognition of its superior qualities, and there is a legend that the plant grew in the Garden of Eden. In the Koran it is referred to as the "paradise tree."

From these dim but exalted beginnings, the banana went on to earn a high place among the plants that serve mankind. It became a food for millions of people and a major item of world trade. In the Western Hemisphere it has long been a basic crop of the tropics, and in several of the Central American countries the banana industry represents virtually the economic lifeblood.

For years bananas have been one of the most important agricultural products imported from Latin America to complement the farm production of the United States. This country has no commercial banana production and must import its entire supply. These imports, without competing with United States agriculture, help the producing countries to import from the States their requirements of flour, lard, milk, butter, eggs, rice, and a variety of manufactured goods.

Such products as rubber and quinine originated in America but were later taken to the other side of the world and were developed in the Far East. The banana is a Far Eastern native that traveled in the opposite direction, reaching its greatest commercial importance in the Western Hemisphere. It is believed to have originated in the humid, tropical regions of southern Asia. Alexander the Great saw bananas growing abundantly in the Valley of the Indus in 327 B. C. From there the fruit took the first great step in its journey westward, apparently traveling across the Indian Ocean to east Africa. In about the seventh century A. D. the Arabs introduced it into the Holy Land and northern Egypt. In 1482, the Portuguese found the fruit growing along the African west coast, where the natives called it by the name "banana." From there it was carried to the Canary Islands.

When the New World was discovered, this promising new fruit soon continued its westward journey across the Atlantic. Friar Tomás de Berlanga, a Spanish priest, much impressed with its food value, took a few roots with him when he sailed to Santo Domingo as a missionary in 1516, only a few years after Columbus dicovered America. When the conquest of the New World moved west to Mexico and Central America, the banana journeyed on to the mainland and then to the shores of the Pacific, thus practically completing its trip around the world. So esteemed was the fruit that, as soon as the location of a new mission was decided upon, one of the first tasks was to set out bananas and plantains to make sure that there would be a supply of food.

Bananas grew well, were universally liked, and rapidly spread through the tropics from Cuba and Mexico on the north to southern Brazil and Paraguay on the south, wherever there was sufficient moisture and freedom from frost. Throughout the tropical and subtropical world they became the proverbial poor man's food, a sort of manna from heaven, grown in almost every garden and on every small farm. Although the early Americans probably did not know it, they were feasting on one of the most healthful and nourishing of foods. Its purity is guaranteed by nature's own hygienically sealed container, and it is rich in minerals and vitamins. When properly ripe it is so easily digested that doctors recommend it for infants and invalids.

To this day the banana remains one of the chief food crops in tropical areas. It is ready for harvest the year around. When ripe it is used as fresh fruit, and when green both bananas and their larger cousins, the plantains, are used extensively for cooking as a substitute for

potatoes and bread. Some are boiled or fried, others are baked like bread, and still others are sliced thin and fried like potato chips or made into soup and gruel. In some areas they are used for livestock feed. Ripe bananas are also dried like figs, and a more recent development is the production of banana flour. In most Latin American countries there is little internal trade in bananas. Commercial production developed only to supply fresh fruit to the large cities and for export.

To consumers in the United States, the banana is a relatively new fruit. The first bunches to arrive in New York were brought from Cuba in 1804. By 1830 occasional clipper ships brought small cargoes, usually red bananas, from Cuba and the Bahamas. From 1857 to about 1880 a small but more regular and increasing trade developed. Toward the close of the Civil War small lots of yellow bananas found their way from islands off the coast of Honduras to New Orleans.

Because of the long, slow journey by sailboats across the hot seas, cargoes frequently spoiled and became worthless. Then came much faster steamships, which made it possible to move the fruit to market in better condition. In 1879 the first steamship was chartered for the banana trade. Soon after the turn of the century the introduction of refrigeration proved to be a major development that permitted shippers to control the ripeness and condition of the fruit so that it would arrive at the market in the best possible condition.

Then came a new problem. Production did not keep pace with the demand. Shippers had to gather their cargoes in small quantities from numerous individual growers in the vicinity of the Caribbean ports. Supplies were uncertain and often insufficient to load a ship. Furthermore, much of the fruit was not in proper condition to withstand shipment.

As more and more people in the United States became accustomed to the new fruit, there began a tremendous development in the Caribbean area to increase commercial banana production in order to supply the expanding market. Teeming jungles in Central America, almost unoccupied except for poisonous snakes, wild animals, and myriads of insects, had to be transformed to provide a steady supply of the fruit. Several hundred thousand acres of jungle land were cleared and drained. Thousands of miles of railway, telegraph, and telephone lines were built. Towns sprang up, and hospitals and schools were established. Dreaded tropical diseases were conquered through medicine and sanitation.

The commercial production of bananas for export alone had become a $50,000,000 industry in the countries bordering on the Caribbean during the years just before the present war. The vital importance of the

Pan American Union photo.

A mature banana plantation, with green bunches almost ready to be harvested. To United States consumers, position of growing bananas seems upside-down. There is one bunch on each stalk.

industry in this area is indicated by the fact that in the republics of Honduras and Panama and the British island of Jamaica bananas account for from 55 to 70 percent of the total value of all exports. In three other countries—Guatemala, Costa Rica, and Nicaragua—bananas are the second most important export, accounting for from 15 to 30 percent of the total value.

The largest exporters in the Western Hemisphere before the war were Jamaica, Mexico, Honduras, Guatemala, Colombia, Brazil, Panama, Cuba, Costa Rica, and Nicaragua. Together these countries exported more than 100 million bunches (about 15 billion bananas) a year and supplied nearly 85 percent of the world's total banana exports. Principal exporting areas in other parts of the world are the Canary Islands off the west coast of Africa and Formosa off the coast of China. Of lesser importance are various countries in equatorial Africa and Hawaii, Samoa, Fiji, and the Cook Islands.

The United States is by far the largest importer of bananas in the world and usually takes more than one-half of the world's total exports. Western Europe formerly took most of the remainder, about 30 percent of the world's exports. United States imports, amounting to over 50 million bunches a year, come almost entirely from American countries and during recent years have been valued in the neighborhood of $30,000,000 annually. Bananas usually constitute the third most important United States agricultural import from Latin America, being exceeded only by coffee and sugar. During the past 15 years this trade has been fairly stable except for declines during the depression and now as a result of the war. New Orleans has become the world's largest banana port and New York the second largest.

The principal banana of commerce is the Gros Michel variety, which grows best in the moist, hot tropical lowlands. North and south of the real tropics are semitropical belts where smaller and hardier varieties, more resistant to the cold and drought, are cultivated successfully.

In the principal commercial production areas the industry is conducted on an intensive, scientific, and carefully regulated basis. When the jungle underbrush has been cut down, rows are marked off with stakes, holes are dug in the ground, and chunks of banana rootstocks or "rhizomes" are planted. Then, before the young banana plants come through the ground, the large forest trees are cut down. Soon the sprouts of the banana plants appear and grow rapidly. Fields must be repeatedly cleaned of undergrowth. During the rainy season they must be drained, and during the dry season extra water must be supplied through costly irrigation. Pruning is necessary so that only the desired number of stalks are left at each hill. Frequent spraying is necessary to control diseases.

Cavendish bananas growing in Cuba. Some fruit of this variety is exported, but most of it is for home use.

The banana plant is not actually a tree but a giant shoot, probably the largest known plant without a woody stem or trunk. It grows to a height of 15 to 30 feet, depending on the variety, climate, and soil. When fully grown, the plant has from 8 to 20 large leaves, each of which is from 6 to 10 feet long and about 2 feet wide. These leaves adapt themselves to the weather; when it is dry and the heat of the sun is too intense, the sides of the leaves fold down, but in wet, cool weather the edges of the leaves curve upward.

In from 12 to 15 months the bananas are ready for harvest. Each stalk bears only one bunch and then must be cut down to allow room for other shoots to grow from the same rootstock. Each rootstock usually bears one bunch each year and the same planting thus continues to bear for a number of years. Yields usually vary from about 150 bunches per acre in the less intensive semitropical areas to an average of about 300 bunches per acre under intensive cultivation.

Each bunch or "stem" is made up of a number of clusters or "hands" which in turn have 10 to 20 indi-

Pan American Union Photo

Jamaican bananas, loaded into a rubber-tired wagon to be transported from field to railroad.

vidual bananas or "fingers." Each bunch therefore usually contains from 100 to 200 bananas. Bunches with fewer than 6 hands are too small for the export trade.

The banana is an extremely delicate fruit and has to be handled practically with kid gloves in order that the fruit will not be damaged. When a banana boat is on its way to a loading port, word is sent out to field supervisors as to the number of bunches to be supplied and the exact time of loading so that the fruit may reach the refrigerated ship as quickly as possible. All bananas, even those for local consumption in the tropics, are picked while the fruit still has a green color. If the bunches were allowed to turn yellow before harvesting, the flesh would lose its best flavor and the skin of the individual bananas would break open, allowing bacteria and insects to reach the inside of the fruit.

THE TREND of banana imports into the United States is shown in the following table:

Calendar Year	*Bunches*	*Dollars*
1870	(1)	186,000
1890	(1)	4,654,000
1910	38,200,000	11,643,000
1929	65,134,000	[2] 36,048,000
1933	[3] 39,613,000	20,205,000
1937	[2] 66,587,000	31,441,000
1940	52,336,000	29,085,000
First 9 months of—		
1940	40,208,000	22,327,000
1941	39,169,000	22,394,000

[1] Not available. [2] All-time high. [3] Depression low.

The harvesting gang usually consists of three men. The "cutter" locates the bunches that are in the right stage of maturity, and with a special knife fitted to the end of a long pole nicks the trunk a few feet below the bunch and gently lowers the top bearing the bunch. The "backer" takes the bunch on his shoulder while the cutter severs it from the plant with a machete and also cuts off the blossom end. The backer then carries the bunch to the nearest pack road, where the "muleman" wraps it carefully to prevent damage and loads it onto a mule or a tramcar for hauling to a railway train. This, in turn, takes it to the ship, where the bunches are quickly inspected, counted, and carefully loaded.

Temperature and ventilation in the ship are carefully controlled so that the bananas do not ripen too rapidly. Before the ship arrives at its destination, unloading crews and refrigerated cars are ready to receive the fruit. Those bunches which are sufficiently ripe are ready for market, but the bulk of the cargo is first placed in special ripening rooms to be put into proper condition before delivery to retail stores.

The most serious threat to the banana industry during recent years has been the disease commonly known as "sigatoka." It came originally from the western Pacific, the native home of the banana, and has spread rapidly westward. By 1922 it had crippled the banana production in Australia and New Zealand and had spread into southern Asia. Soon it spread through the banana-growing areas in Africa. By 1935 it had crossed the Atlantic to the Western Hemisphere, where, because of its great damage and rapid spread, the natives called it "The Green Dragon."

After years of painstaking scientific research, it was found that this disease, which threatened to destroy the major industry in several Central American countries, could be controlled by repeated and regular spraying with Bordeaux mixture. This procedure, however, entailed huge expenditures not only for the spray materials but for spraying equipment, such as pipe lines, pumps, and mixing stations. This added expense incident to spraying forced growers to adopt other far-reaching changes and a much more intensive method of production in order that they might obtain higher yields to pay the increased spraying costs. Some growers moved to areas with better land. Extensive irrigation was applied and plantings were kept in bearing for 10 or more years instead of the 5 years which was once the customary life of a planting.

The war, with its severe strain on ocean shipping, is now making deep inroads into the banana export business. The virtual closing of the continental European market in the fall of 1939 had only a slight effect, but late in 1940 the United Kingdom stopped importing bananas from Jamaica, and the island's exports of the fruit fell to less than 25 percent of the pre-war level. That left the United States as almost the only important market and since this country entered the war, its banana imports have been declining.

Bananas can scarcely be regarded as a strategic war material, even though they are being used to some extent as a substitute for grease in launching ships. Consequently, sufficient shipping space cannot be allotted to move them in the usual quantities. This means, for one thing, that consumers get fewer bananas to eat, particularly in the northeastern part of the United States. More important is the problem that exists in the American republics that are faced with an unshippable surplus of their basic export crop. The situation has created one of the wartime economic headaches of the Americas.

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Livestock raising, which dates from an early time in Venezuelan history, is still an important source of the country's wealth.

Rubber From the Russian Dandelion

Kok-saghyz, a wild plant domesticated in the Soviet Union, is low in rubber content but can be harvested the same year it is planted. That is why seeds were rushed half way around the world by air this spring for the first plantings in the Western Hemisphere.

by E. W. BRANDES

A tough little recruit from the plant world has just arrived in the Americas and signed up for war service. Its name is kok-saghyz, and last year it was grown for rubber on about two million acres in the Soviet Union. This year, as the United Nations consolidate their resources, it is being planted on North and South American soil for the first time.

Kok-saghyz root—about ½ natural size.

The newcomer — a domesticated relative of the familiar American dandelion—reached western shores by a magic-carpet journey that was in the best traditions of its native home in Central Asia. Early this summer, the first shipment of kok-saghyz seed was whisked by air from Kuibyshev, the temporary capital of the Soviet Union, to Washington, D. C. After a pause for certain rites of the seedsman's art and for repacking, the seeds continued by plane to 60 prepared test fields in the United States, Canada, and Alaska. All this happened within a period of three weeks. Only the reversed seasons south of the equator prevented tests from being started simultaneously in South America, but once spring comes to that part of the New World, they will be made as far south as Patagonia. The success of the American tests will determine where larger plantings will be made next spring.

The common dandelion of the United States is naturalized from Europe but there are native American kinds also. Like its American cousins, kok-saghyz contains rubber in the lactiferous tubes of the root and other parts, but nature gave it more rubber to begin with and Russian scientists have increased the percentage by breeding and selection, although the best strains exist even now in limited amounts. Doubtless the imported weed pest of the lawns, or the native American kinds, could have been improved by breeding just as was kok-saghyz in the Soviet Union, but the United States had more promising wild plants such as guayule and goldenrod for beginning points in breeding and had not the same economic incentive for rubber self-sufficiency.

The currently important root has been a mystery even to the weed exterminators who seldom succeed in bringing up more than a tenth part of it. The long taproot contains most of the rubber-bearing latex, which also may be seen oozing from cut flower stems or leaf midribs. It has a disagreeable, acrid taste well known to children. Dandelions are grown commercially in the United States as salad plants. The cultivated varieties were derived from the naturalized European species.

Dandelions, of different species but essentially the same appearance, are found around the world in the middle latitudes. The dandelion "belt" of the north temperate zone cuts across the New World fairly far north and few dandelions are seen in the southern United States except at high altitudes. The common name of the American species is from the French *dent de lion* or lion's tooth, in allusion to the toothed leaves. The French species is *Taraxacum officinale,* the same as the American. The species from the Tian Shan mountains of the Republic of Kazakstan in Central Asia, *Taraxacum koksaghyz,* is more robust and the raw roots contain about 2 percent rubber, dried roots about 6 to 7.5 percent by weight. The word *kok* in the Kazak language means root and *saghyz* means to chew, an indication that gum chewing is not unique with North Americans. In the European parts of the Soviet Union up to 3,000 pounds of raw roots have been produced on an acre of fertile land, which amounts to about 30 to 60 pounds of rubber. These figures are for large-scale production. Higher percentages of rubber and higher yields have been reported in experiments. The sugars and other carbohydrates of the root may be used for alcohol production as a by-product.

The Allied Nations' war needs have created interest in the dandelion as a source of rubber in spite of its relatively low yields. In contrast with the cultivated Pará rubber tree, which may yield 800 to 1,000 pounds or more

Kok-saghyz seeds and plant. (Upper left) untreated seed, magnified 5½ diameters; (lower left) stages in germination of seed following treatment, magnified 3½ diameters; (right) full-grown plant in bloom in Russia.

of rubber per acre per year, or cultivated guayule, yielding 350 pounds, the dandelion by any standard of comparison in normal times is decidedly second rate. The great merit of the dandelion lies in the fact that it can be harvested and the roots processed the same year that it is planted, a characteristic that it shares with goldenrod. In the present emergency, with a mounting need for natural rubber, "a bird in the hand is worth two in the bush," and the main existing supplies of natural rubber, the product of cultivated Pará trees of the Orient or of wild Pará and Castilla trees in tropical America, are decidedly "in the bush." The production of wild rubber in tropical America can be vastly increased, but lags in the formulation of international agreements and the modernization of working conditions on a large scale in remote areas are bound to slow realization of potential production. Since new plantations of Pará trees require a minimum of 5 to 7 years of development before tapping and cultivated guayule may not be harvested economically in less than 4 years, prompt relief cannot be expected directly from those sources, although they are now healthy infants in the New World.

Motivated by curiosity as much as by serious expectations of its economic usefulness in the Americas, plant introducers of the United States Department of Agriculture coveted the kok-saghyz as early as 1932, the year after it became known as a potential economic plant in the Soviet Union. Efforts made then and later to obtain seeds were not successful, quite probably because of the inherent reluctance of all plant breeders to turn loose new creations until certain of their final usefulness. Early this year, however, the good offices of the Department of State and of Ambassador Maxim Litvinoff were instrumental in clearing the way for a first shipment, which arrived in Washington on May 8. The solicitude of the Department of State for the shipment may be judged by a recent file of two-way cablegrams that represent instructions, and then almost daily inquiries on the progress and advices on the varied fortunes of two unprepossessing gunny sacks of seed as they traveled by air half round the world. The unstinted efforts of Loy Henderson, now Assistant Chief of the Division of European Affairs and formerly First Secretary of the American Embassy in Moscow, greatly assisted in making this importation possible.

Although it is an unfamiliar crop to the Americas, predictions of the parts of the New World where kok-saghyz may be expected to develop normally are not entirely conjectural. The plant is native to a part of Asia having an environmental complex that can be matched in the northern United States and Canada, and, since it has been proved rather adaptable, even Alaska may

be found suitable for cultivation of kok-saghyz as an annual crop. In general, the plant demands humid conditions and soil of high fertility. The experiments now under way to determine localities suitable for it are expected to shed light on details of soil, climate, and other factors affecting growth. Tentatively, a geographic pattern of presumptive suitable localities has been constructed, dependent mainly on latitude, rainfall, and isothermal lines. The location of spring plantings already set out and the plan for fall plantings indicate the present conception of the pattern based on these theoretical considerations. Similarly, an examination of conditions in South America will determine the areas in the vicinity of the "roaring forties" where normal development of kok-saghyz may be expected.

Like guayule seed, the kok-saghyz seed is minute and requires preconditioning before planting to insure prompt, synchronized germination of all seeds and uniform development of the plants. Since one of the chief causes of low yields is poor germination of seeds and consequent gappy stands, close attention is given to seed treatment. The preconditioning may consist of soaking in water for 3 or 4 hours about 4 days before the planting date, spreading in a 1-inch-thick layer at ordinary room temperature of about 70 degrees Fahrenheit and stirring every few hours to aerate the seed. When the first seeds germinate, usually in 2 days, the whole lot is removed to a cooler room and spread thinly for partial drying to prevent further pregermination. After another 2 days, or 4 days after soaking, the seeds are ready for planting.

When conditions permit, more satisfactory germination is assured by the somewhat elaborate treatment of stratification or vernalization. The seed is moistened and then kept on ice or under melting snow for 15 days or more. After 10 to 15 days daily test plantings to determine germinability are advisable. This is accomplished by planting some of the seed in rows in a "flat" or pot on successive days. Each day a row of seed from every successive test is pricked up and examined. If the seed germinates rapidly and uniformly, it is ready to remove from the ice, dry somewhat in low temperatures, and plant in the field. It sometimes happens that after a reasonable period of vernalizing the test seeds show no sign of germination within 2 or 3 days, and, if so, an additional treatment is indicated. All of the seed is removed to a room at 50 to 55 degrees Fahrenheit, spread out and stirred or tumbled about at two- or three-hour intervals for a day or two to aerify it. This usually accelerates the conditioning process and the seed can safely be planted in the field.

Whether the ordinary soaking method or vernalization is followed, the seed must be carefully watched for evidence of germination, if brought to a warm place to spread and dry. The process of germination can be arrested by removing to a cooler place and spreading more thinly. Should weather conditions be temporarily unsuitable for planting, arresting the development becomes very important. The whole process of seed treatment requires alert watchfulness because of the danger of mass germination before planting, which would ruin the entire lot of seed.

The seed is planted April 15 to May 1 in rows 15 inches apart at the rate of 3½ to 4½ pounds per acre. Wider spacing of rows is admissible to conform with implements for cultivation. Like sugar beets, kok-saghyz is a root crop and the fields require deep plowing, but since the seed is to be covered with only one-third inch of soil the plowing is done in the fall to permit settling of the soil and fine seedbed preparation in the spring. Spring plowing is likely to delay or prevent the necessary compacting essential to making a level seedbed for such seed and tends to make the top layer dry in patches if rains do not come.

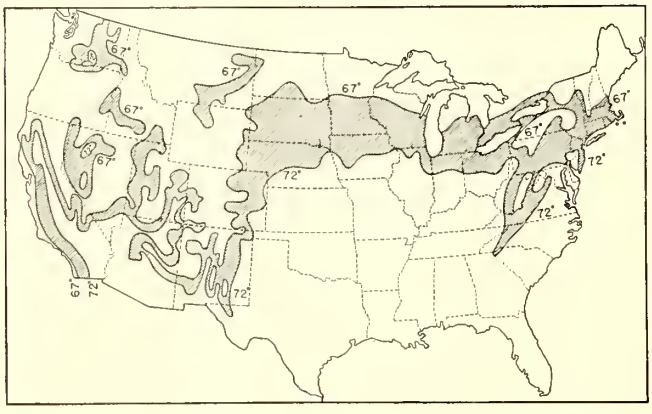
In the spring, as soon as the tops of the clods in fall-plowed lands begin to dry, the land is cultipacked or disked two or three times to make a level bed with a loose, shallow top layer, and the preconditioned seed is sowed at once if weather conditions permit. For the indicator plantings of one-fourth acre to one acre, hand planters such as used for lettuce have been found to suffice. Since it is important to let the air in, a covering of only one-third inch or less of soil is best to help insure an even stand. Experiments at Beltsville, Md., confirm the fact that deeper planting seriously retards the "breaking through" of seedlings. Because of the timeliness and unique significance of the tests in 1942, some stand-by provision for irrigation has been advised in case the season should be abnormally dry.

By following the above principles, a good stand is ordinarily obtainable. No succeeding operation can repair failure to obtain a dense initial growth of seedlings with no breaks in continuity of the rows. When the seedlings begin to emerge, the field is weeded and the soil between the rows is cultivated. Selective thinning of the plants to 2 to 4 inches apart in the rows improves the quality of rubber produced. Rogueing to remove non-rubber-bearing species of dandelions mixed with the kok-saghyz seed is important.

The effect of fertilizers on percentage of rubber is not well understood and appears to depend on the character of the season. When moisture conditions are favorable, the application of phosphates increases the storage of rubber, but an opposite effect has been noted in dry years. Light applications of nitrates tend to increase the rubber content of roots and there is a similar effect of potassium, but heavy applications of nitrogen lowers the rubber content in normal years. In dry seasons, increased applications of nitrogenous fertilizers have a beneficial effect. For improving yields without an ad-

verse effect on quality, moderate use of a complete fertilizer is regarded as the safe course to pursue until more exact information is obtained.

Although the root harvest does not take place until October, the important business of gathering seed for the next crop is done in June. Until a mechanical air-suction device such as that used for gathering guayule seed can be perfected, the harvesting of kok-saghyz seed must be done by hand and it is a laborious process. The seeds are gathered at the stage when the seed head assumes a cylindrical form, just before it becomes globose. The opening of the seed vessels proceeds very fast and it is necessary to inspect and go through the fields 3 or 4 times a day during harvest. For about 2 weeks the maturing seed heads increase in number each day, then the number levels off for about 10 days, after which there is a rather abrupt decline in seed production. The



Shaded area indicates parts of U. S. where kok-saghyz may be expected to grow normally.

seed vessels are first thoroughly dried by spreading them in layers an inch thick on canvas. After 2 days they are covered with gauze to prevent their being blown away and are exposed to direct sunlight to complete the drying. The dry seed vessels are then threshed and the seeds cleaned in a fanning mill, sacked, and stored in a dry place.

If spring-planted kok-saghyz is harvested as an annual, the root gathering starts in October and extends into early November. The roots are dug with a modified beet lifter. After they are underdug, the roots are pulled out by hand and piled after the soil is shaken off. Tops are twisted off or cut off, taking care that the knife does not touch the taproot. As in the case of seed gathering, the harvesting operations make heavy demands for labor, a situation that makes mechanization of the utmost importance. Two-year plantations are harvested at the end of the peak of seed bearing, or about the first week of July. Much heavier seed crops are obtained the second year.

The harvested roots are cleaned, spread out, and dried to about 20 to 30 percent moisture in well-ventilated barns. If artificial heat is used to hasten drying, care must be taken to avoid overheating, but the temperature may be raised to 140 degrees Fahrenheit with safety. The spread-out layer of roots is turned with a spade several times a day to insure even drying.

Processing consists of slicing and steaming the raw material, with lye or another anticoagulant added, and separating the crude rubber by decanting or centrifuging, after which the rubber is coagulated, washed, and sheeted by passing it through a roller mill.

Under war conditions the problem of constructing industrial plants for processing kok-saghyz roots promptly raises the bugbears of priority ratings for materials and availability of skilled labor. The flow sheet for production of crude rubber from kok-saghyz is somewhat similar to that employed in the fabrication of sugar from sugar beets however, and adaptation of some of the equipment to the dual purpose appears to be worth investigating. The idea of such adaptation was actually advanced in the Soviet Union just before the outbreak of hostilities with Germany.

In the United States, the presumptive suitable localities for emergency kok-saghyz production exactly coincide with the present sugar-beet areas. Power plants, steam, housing, and facilities for transporting the roots as well as certain factory equipment are available at 67 sugar-beet factories conveniently situated in the "belt." The harvesting times for the two crops overlap somewhat, but the kok-saghyz roots require a period for drying and could be processed in the factories after the close of the sugar-beet campaign. If the fall harvest should prove impracticable because of heavy demand for labor, the two-year plantation with harvest during June and July, or other devices, might fit into a scheme of plantation strategy that would tend to level out and stabilize labor requirements. Under present conditions, the idea of extending the use of beet factories, without interference in their regular work, seems worth serious consideration and the interest of sugar-beet company officials has been enlisted in a preliminary study of possibilities.

In cooperation with 23 State agricultural experiment stations, indicator plantings, 60 in number, have already been made across the northern half of the United States and in Canada and Alaska. Untreated seed was air expressed to final destinations the day the initial air shipment was received from the Soviet Union. Part of the seed was vernalized in Washington and later sent to the same stations by air, packed in improvised ice boxes. Fall plantings will be made in the southwestern and Gulf States. The accompanying map shows in general the parts of the United States believed most suitable for kok-saghyz. Within the indicated areas are high mountains

Inspecting a laboratory planting of treated kok-saghyz seed to determine percent germinated in a given time. Picture was made during tests this spring at Department of Agriculture Experiment Center, Beltsville, Md.

and other obvious exceptions to the areas believed suitable. A few indicator plantings will be made outside of these areas, and in some of them no doubt a robust or lush growth will reward the experimentor. Secretion and storage of the hydrocarbon rubber in higher percentage is the aim, however, and lush growth is not necessarily correlated with high quality of the product.

The results of the indicator plantings will dictate the areas to be selected for extensive plantings in 1943. Anticipating larger plantings in that year, arrangement was made for shipment of tons of the featherweight seed from the ports of Murmansk, far north in the land of the midnight sun, and Bazra, in Iraq at the head of the Persian Gulf. These shipments, originating in Moscow and Kuibyshev, respectively, are now approaching the United States after long journeys via Iceland and the Cape of Good Hope. Attention has also been given to seed supply by increase in the United States. A second air shipment from the Soviet Union that arrived in the latter part of May was used to plant large blocks in Michigan, Wisconsin, Minnesota, and Montana for seed production. Additional seed from the indicator plantings will insure the bringing into existence of some natural rubber from this source in 1943.

A program of research, involving all the tools of the modern plantsman, has been instituted to explore possibilities of further improvement of kok-saghyz as an economic plant. Geneticists and plant breeders, plant physiologists and agronomists have been signed up for this war effort. They will consider the possibility of improving native species and giving a postgraduate course to the naturalized newcomer.

The United Nations urgently need natural rubber, to be used as such and later to be mixed with synthetic rubber substitutes as a means of extending their usefulness. The most immediate major sources of natural rubber are the wild rubber trees of tropical America, but there is no prospect that they will provide full relief. That is why the Russian dandelion, which yields rubber the same year it is planted, has been brought in as a pinch-hitter on a team that has only one big-name regular, the cultivated Pará rubber tree.

Trade Agreement With Peru

by LOUIS C. NOLAN

Peru and the United States are "united in this crucial hour," declared President Manuel Prado of Peru during his recent trip to this country. As if to emphasize the truth of his statement, a reciprocal trade agreement between the United States and Peru was signed on May 7, the very day that President Prado descended from a plane in Washington for the first visit to the United States ever made by a South American chief of state during his term of office.

The agreement, signed by Secretary of State Cordell Hull for the United States and by Minister of Finance and Commerce David Dasso for Peru, climaxed a series of far-reaching politico-economic understandings between these two friendly nations (*Agriculture in the Americas*, June 1942). Under the most-favored-nation principle, its provisions are extended automatically to every other American republic and to every country with which the United States is at peace except Cuba, with which there are special tariff arrangements.

Despite the fact that for two decades the United States has been the leading supplier of goods to Peru and has ranked first or second among that country's export markets, trade between the republics has been much smaller than might have been expected, considering the area and resources of Peru. The present crisis supplied the stimulus needed to awaken both countries to the opportunity that existed for a mutually beneficial increase in trade. The extent to which their trade relationship is being re-evaluated in terms of present necessities and future potentialities for greater mutual helpfulness is illustrated by several of the provisions of the new trade agreement relating to agricultural products.

A more detailed analysis of the agricultural provisions of the trade agreement between Peru and the United States will appear in the July issue of *Foreign Agriculture.*

Barbasco root, also known as cube or timbo root, is a case in point. Native to northern South America, it contains rotenone, which is important as an insecticide for farm and household use. The root is imported into the United States in both crude and processed form. Peru is the leading supplier, but large quantities of derris root, which contains the same poison, came from the Far East in normal times. To encourage Latin America to help make up the threatened import deficit of rotenone-bearing roots, the agreement reduces the duty on processed barbasco root and binds the crude article on the free list.

Cinchona and similar barks from which quinine may be extracted and quinine sulphate and related alkaloids also are important instances, especially since United States requirements of quinine in the past have come almost entirely from the Netherlands Indies. In the hope of further encouraging production in Latin America, the present agreement binds cinchona and similar barks and quinine sulphate and related alkaloids on the United States duty-free entry list, although they have been bound on this list in previous agreements.

Pyrethrum on the Free List

Pyrethrum, used mainly in insecticides for killing household pests, is another illustration. Before the war, United States imports consisted chiefly of the crude product and came principally from Japan. To encourage production within the Western Hemisphere, the agreement with Peru binds crude pyrethrum on the duty-free entry list and reduces the duty on processed pyrethrum by 50 percent. United States imports of pyrethrum in 1940 were valued at about $3,000,000.

Other Peruvian agricultural commodities which the agreement binds on the free list—because the United States either does not produce them at all or does not produce them in quantities sufficient to supply its own needs—include crude rubber, coffee (except coffee imported into Puerto Rico), guano, oiticica oil, goat and kid skins, unground ginger root not preserved or candied, and tamarinds. Of these commodities, guano and oiticica oil have never been bound on the free list in previous trade agreements with other countries.

In the agreement the United States undertakes to admit under lowered duties hemp fiber, which has important war uses. The duty on hackled hemp is reduced from 3½ cents per pound to 1¾ cents per pound; that on hemp (not hackled) and hemp tow, from 2 cents per pound to 1 cent per pound. Until 1940 Italy was by far the leading supplier of hemp imports. By utilizing resources available in the United States and Latin America, the Western Hemisphere could make itself self-sufficient in hemp production. Under the existing war conditions, the present duty reduction may stimulate Latin American production.

With regard to flax fiber, including straw, tow and noils, the agreement simply binds the existing United States rates, which had been reduced in previous agree-

ments by the maximum amount permitted under the Trade Agreements Act. Since three-fourths of the world flax fiber production in recent years has centered in the Soviet Union and nearly all the rest in other European countries, the war has made it difficult for the United States to be supplied from its normal sources. Before 1940 little flax fiber was imported from Latin America, but in that year Chile, Peru, and Argentina supplied considerable amounts. Imports from Peru, including those of tow and noils, were valued at $70,900. Binding the present duty may encourage further production in Latin America.

Coca Leaves and Ginger Root

Provisions are contained in the agreement cutting in half the United States duties on imports of coca leaves and ground or preserved ginger root. The duty on alpaca, llama, and vicuña hair was cut by amounts ranging from 43 percent to 50 percent, depending upon the condition in which it is imported. None of this hair is produced domestically. Apparent consumption in 1939 was less than 1 percent of that of apparel wool.

The agreement also reduces the duty on sugar imported from all full-duty countries by 50 percent, from $1.875 per 100 pounds of raw sugar to $0.9375. Imports of sugar into the United States were limited by quotas from 1934 until April 13, 1942, when the President suspended these quotas in order to make additional supplies of foreign sugar potentially available to domestic consumers during the emergency. The present reduction in duty, coupled with the suspension of the quotas, should encourage Peruvian producers to export some additional quantities of sugar to this country.

The agreement reduces the duty on long-staple cotton (having a staple of 1⅛ inches or more in length) from 7 cents per pound to 3½ cents per pound. The mere fact that the agreement reduces the duty on long-staple cotton does not in itself mean that larger amounts of this product will enter the United States. The agreement does not increase the annual over-all quota, established by Presidential proclamation on September 20, 1939, that limits the total amount of long-staple cotton permitted to enter the United States from abroad. It does, however, bind the United States Government to request the Tariff Commission to make an investigation under Section 22 of the Agricultural Adjustment Act to determine whether or not it would be possible at this time to terminate the existing long-staple quota allocations by countries, while leaving the over-all import quota precisely where it now is.

If the Tariff Commission, upon investigation, concludes that these country allocations can be deleted from within the existing over-all quota and the President issues a proclamation to this effect, no country would be guaranteed a specified part of the United States long-staple market. Instead, Peru and other countries would be free to compete for as much of the restricted United States market as each could get in any one quota year.

The provisions of the agreement should work to the advantage of the United States as well as of Peru, for they implement the promise of President Prado that "all the natural resources of Peru, its great agricultural, mineral, and forest wealth will be mobilized for the closest cooperation in the task of common defense."

The United States, on the other hand, can help supply Peru with a number of agricultural foodstuffs which that country must have to round out the needs of its consumers. Lacking self-sufficiency in its production of fresh fruits, for instance, Peru agrees to admit fresh apples, pears, and plums from this country duty free for a specified season each year, when United States fresh fruit exports to Peru normally are at their peak.

Flour for Amazonia

Needing substantial quantities of American wheat flour in the eastern part of the country around the headwaters of the Amazon River, Peru agrees to bind its existing moderate rate of duty, equivalent in 1940 to about 28 percent ad valorem, on this United States product. Of the wheat flour imported into Peru in 1940 and valued at about $91,000, about $83,000 was obtained from the United States.

Peru agrees also to cut its duties on rolled oats by 33⅓ percent; on certain canned vegetables by 50 percent; on a variety of dried and canned fruits by 50 percent; on walnuts by 50 percent; and on flour made from rye, corn, rice, oats, or farina by 46 percent. Imports from the United States of this group of farm products were valued at just under $200,000 in 1940.

In addition to the provisions relating to agricultural products, Peru grants duty reductions of 50 percent or more on safety-razor blades, parafinned cardboard containers, dictating machines and parts, flashlight bulbs and radio-receiving tubes, and accords various tariff advantages on other United States industrial goods.

The trade agreement with Peru was the thirteenth to be concluded between the United States and another American republic. It will go into effect 30 days following its proclamation by the presidents of both republics or, if both proclamations are not made on the same day, 30 days following the later.

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When Venezuela was first discovered, it was inhabited by 150 tribes of Indians.

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The Panama railroad, built in 1855, was the first transcontinental railroad constructed in the Americas.

The Two Paraguays

A potentially valuable farming area and a near-wilderness make up this South American nation that is unique among the American republics in its history and its racial composition and is known for its forest products, stimulating climate, and rustic charm.

by PHILIP LEONARD GREEN

Paraguay, a country larger than any State in the United States except Texas, is a land of an elusive charm that sends travelers home bursting with adjectives like "picturesque," "primitive," and "pastoral." One poetic visitor said there was "a brook at every doorstep."

There are really two Paraguays. The eastern section, where visitors usually spend their time, consists largely of broad, low-lying plateaus with a fairly rich red soil and a heavy growth of trees. It is there that most of Paraguay's people live and most of the country's business is done. Lying near the north border of the south temperate zone, the region has a climate that for most of the year is mild yet stimulating. During the hot season in January and February, temperatures as high as 105 degrees have been reported, but the mean annual temperature is in the low 70's.

To the north and west lies the other Paraguay, a region so different that it might almost be in another world. A part of the well-known Chaco, it is one of the most sparsely populated sections of the globe. It is a subtropical land where vast plains are laced with a network of rivers that are forever changing their courses, and vegetation consists largely of thorny scrub trees and coarse grasses.

The country's history as a bulwark of Spanish influence in South America has been both eventful and unique. In 1537 the Spaniards, pushing up the Paraná River in search of a short cut to Peru, founded Asunción, today the capital of Paraguay, and made it one of the most important colonization centers on the continent. From this stronghold set out many a Spanish expedition, including the group that reoccupied the once-abandoned site of Buenos Aires, which became in time the metropolis of the region.

The most advanced residents of Paraguay in precolonial days were the Guaraní Indians, one of the few South American tribes that were never conquered. The story of how the Spanish Jesuits of old gathered the Guaranís about them in settlements to which they gave the odd name *reducciones* (because they "reduced" the Indians to the white man's ways of life) constitutes one of the most interesting chapters of colonial history. There were 32 *reducciones* in what is today eastern Paraguay, constituting a veritable chain of outposts for Spanish control of the region against the westward push of the Portuguese settlers from the Atlantic coast. But the *reducciones* gradually began to produce for outside sale certain commodities which competed directly with those raised by the large landowners. This situation, together with the growing political influence of the Jesuits, caused the Order to fall into disfavor and in 1767 its members were compelled to leave the Spanish colonies. Their work was taken up by other religious groups, but these never exercised the same influence over the Guaranís, who largely went back to their former ways. Yet the influence of the *reducciones* can often be detected to this day in some of the folkways.

Pictures by John Strohm; courtesy Prairie Farmer.

Farm home in Paraguay. The calf was given to the boy by his godparents, a custom of the country.

Another historic influence is that of the famous war of 1864–70. In this bloody struggle, Paraguay had as opponents 3 of her neighbors—Argentina, Brazil, and Uruguay. Led on by the tyrant López II, the Paraguayans fought with a bravery that has caused widespread admiration but which proved to be almost suicidal. As a result of this conflict, the country's population was reduced by about half. Most of the remaining inhabi-

tants were women, children, and old men. Rarely has a nation suffered such losses and survived.

Paraguay did survive, but the aftermath was felt for a long time. It took about 50 years for the population losses to be regained and for the proportion between males and females to return to something like normal. To this day women perform a considerable number of tasks usually associated with men, particularly in the fields—a reminder of the time when their work was necessary for the country's survival.

Covering an area about the size of Colorado and Nebraska combined, Paraguay contains less than 1,000,000 people, who differ radically from residents of the surrounding nations in their racial make-up. Ninety-seven percent of all Paraguayans carry in their veins the blended bloodstrains of the Guaraní and the Spaniard. Those in the small minority that constitutes the intellectual and political leadership of the land show their Spanish background more markedly, while the vast majority of the rural and laboring population give evidence of a greater Guaraní influence. The Guaraní language is spoken almost exclusively in the country districts and is even heard along with Spanish on the city streets.

In addition to the predominant Indo-Hispanic strains, Paraguay has also some representatives of various white European peoples, as a result of later immigrations. Among these are an estimated 17,000 Germans, 10,000 Poles, and 7,000 Italians. Between 1926 and 1931, Russian Mennonites were welcomed in quite large numbers, and today 35 settlements of them are living under fairly primitive conditions in the Chaco area west of the Paraguay River. Some German Mennonites have also come into the country.

The agricultural history of Paraguay begins with the ancient Guaranís, who are believed to have been growers of corn and manioc root, both of which are still staple food crops in the country. There is some evidence, in fact, that the most primitive known ancestor of corn

Students of the National School of Agriculture receiving pointers on cotton, the chief cash crop.

Paraguayan farmer in his field of mandioca. He raises some to eat and some to sell.

originated in the part of South America that includes Paraguay, a region which also gave the pineapple to the world.

Although four-fifths of the inhabitants of the country live in rural areas, only 1 percent of the land is in cultivation. For the most part this is in clearings in the forests of the eastern section. The leading export crop is cotton, which during the period just before the present war accounted for about a fourth of all Paraguayan exports. An annual crop of around 50,000 bales gives Paraguay fifth place among the cotton-producing countries of Latin America, and production has been increasing in recent years. There are also some tobacco exports.

Paraguay is also known in international trade circles for its cattle industry, which began in 1546 with the importation of 8 head from Spain. Cattle run on the range in the Chaco region. They are not fat when they go to market, so bring relatively low prices on the hoof. Beef processing, however, is important, and there are two meat-packing plants near Asunción, one financed by United States capital and the other by British interests.

Paraguay's other chief exports are products harvested from the wild state, notably quebracho wood and yerba mate. Quebracho is one of the scrub trees native to the Chaco region. The name, translated literally, means "ax breaker," and the wood is one of the hardest known. It is used for making railroad ties and yields for export the important tanning material, quebracho extract, which is of strategic importance in wartime.

Yerba mate is often called Paraguay tea, because it was first seen in that country, which now shares the export market with Argentina and Brazil. The beverage made from the leaves is one of the most popular in South America and has been gaining in use in the other parts of the world. Paraguay produces more than 30 million pounds of the leaves a year and ordinarily exports a third of its production.

Paraguay is the world's only source of petitgrain oil,

distilled from the crushed leaves of a species of wild orange tree and used in the manufacture of perfumes. Exports ordinarily run to the value of $200,000 or more a year. Lemongrass, source of another highly prized essential oil, has been introduced in the same area but is not developed commercially.

Citrus fruits are grown for home consumption and small quantities are exported, Paraguayan grapefruit being highly regarded for their flavor. Castor beans are now being grown with the export market in mind. Other crops, principally for home consumption, include sugar, rice, potatoes, beans, and grapes.

Paraguay has no seacoast, and one of its greatest problems has been how to get farm products to the export market. A steamship company operates over the Paraguay River between Asunción and Buenos Aires, but the rates are high, as are those of the international railroad which covers the same distance. Accordingly, only products that are in strong demand and relatively high in price can be exported profitably.

There are few mineral deposits in Paraguay and practically no large industries. Quebracho-extracting plants, sawmills, and canning factories send their products abroad as well as to local markets. Purely domestic industries include the manufacture of cotton textiles, plywood, plows, soap, candles, bricks, furniture, matches, soft drinks, beer, ice, and condensed milk. The modest lacework industry turns out exquisite products and furnishes a home enterprise in which the Indians engage.

Imports include the usual array of manufactured goods—hardware, textiles, foodstuffs, wines and spirits, drugs, ready-made clothing, and automobiles. Among the foodstuffs imports, incidentally, are butter and cheese, for Paraguay's cattle herds are made up largely of beef animals.

Since many of the country's exports and imports leave and enter through Argentina, it is difficult to determine exact destinations and sources. Published figures indicate, however, that in the pre-war year of 1938, Germany was Paraguay's chief customer outside Latin America and Japan was the principal non-American supplier. The United States and the United Kingdom ranked high in both categories.

Of great importance to Paraguay's agriculture is the Banco Agrícola, an institution that looks back upon a half century of useful existence. It is a sort of combination agricultural extension service, experimental station, and credit and commercial banking institution, with offices at strategic locations in farm areas. It has had a profound influence on the life of the country as a vehicle for agricultural development and as such is a national institution, the importance of which cannot be overestimated.

Recently Paraguay has intensified its relations with other American republics. It was one of the first Latin American countries to borrow technicians from the United States Department of Agriculture for a survey of its agricultural resources, and it has participated in sending students to the United States under the Buenos Aires Convention of 1936. Recently, Paraguay and the United States have raised their respective legations to the status of embassies, thus reflecting the increasing importance of relations between the two countries.

The oxcart is the principal vehicle in the farming areas of Paraguay.

An outstanding instance of United States-Paraguayan cooperation is the new road between Asunción and Villa Rica, for which the Export-Import Bank allocated $3,000,000. It is designed to promote the development of the bordering region and may serve as a link on the projected stretch of the Pan-American highway system from Argentina to Brazil. The road was the dream of and is named for the late Gen. José Estigarribia, who as President of the Republic in 1939 and 1940 was an outstanding friend of the United States and enjoyed the respect of his countrymen, as well.

READING About the Americas

The ABC of Latin America, Frank Henius; 134 pp., David McKay Co., Philadelphia, 1942. An informational resume, giving physical data, information on government, population, cities, leading occupations and industries, leading imports and exports, and travel in the 20 Latin American Republics.

Behold the West Indies, Amy Oakley; 540 pp., D. Appleton-Century Company, New York, 1941. Discusses points of interest in various West Indian countries, by geographical era, from the standpoint of travel.

Outline-History of Latin America, A. Curtis Wilgus and Raul d'Eça; 410 pp., Barnes & Noble, Inc., New York, 1941. A new edition of a standard outline history of Latin American countries with excellent bibliography.

ALONG THE

Agricultural Front

▲ Bolivian Highway to Spur Food Transport

To facilitate the movement of foodstuffs from the food-producing Santa Cruz district to the food-consuming mining districts of the *altiplano,* the Bolivian government plans to construct 225 miles of highway between Cochabamba and Santa Cruz. For the project a Bolivian development corporation will be established with credit from the Export-Import Bank of Washington. It is to be the first step in a $25,000,000 development program in Bolivia agreed upon at the Rio de Janeiro conference of foreign ministers.

▲ Paraguay to Substitute Cotton for Jute Bags

Because of the growing shortage and increasing price of jute bags, the government of Paraguay has initiated a program aimed at the complete substitution of cotton for jute bags. Not only will the program remedy the existing shortage of jute bags, but it will aid substantially in assuring an additional outlet for the country's increasing cotton crop.

To begin with, the mandatory use of cotton bags has been restricted to marketings of domestically produced sugar and flour. As soon as sufficient facilities for producing cotton bags have been established, however, their mandatory use may be extended to other products.

In order to protect manufacturers of cotton bags, it has been decreed that, if either sugar or flour is imported in bags made from jute, such bags will be subjected to a tax equal to 25 percent of the difference between the value of the jute bag and a corresponding cotton bag. The government will periodically establish the price differential between the two types of bags for purposes of the tax.

▲ Colombia to Encourage Fertilizer Manufacture

Information has been received from Bogotá that the National Congress of Colombia has passed a law providing for the investigation of basic materials for fertilizer uses and for the manufacture of such fertilizers. The government will invest 500,000 pesos in the enterprise.

▲ Peruvian Loans to Help Maintain Food Supply

The Industrial Bank of Peru has been empowered to grant loans for improving the country's food supply and shipping facilities. These credits will be used to open new foodstuffs plants, enlarge the existing ones, and to organize fishing enterprises and purchase vessels and equipment.

▲ Experiment Stations for El Salvador, Nicaragua

Preliminary agreements have been reached by the United States government, through the Department of Agriculture, with the governments of El Salvador and Nicaragua for cooperation in the establishment of agricultural experiment stations in those countries. The accords are similar to the one recently signed with Peru, which provided for the establishment of a cooperative experiment station at Tingo María in that country (*Agriculture in the Americas,* June 1942).

The general function of each station will be to serve as a center for production investigations, extension work, plant propagation and other activities necessary in the development of the country's agriculture, with emphasis on cash crops that complement the agricultural production of the United States. Rubber production is one of the objectives of both agreements. In each case, the Latin American government is to supply land and buildings, with the United States providing certain scientific personnel and equipment not available in Central America.

The headquarters of the Salvadoran station will be at Hacienda Zapotitán, approximately midway between the cities of San Salvador and Santa Anna and less than 5 miles from the Pan American Highway, which is paved through El Salvador. In Nicaragua, the project will center near the town of Recreo and will have access by river to the Caribbean port of Bluefields and by highway to the national capital, Managua, and the Pacific.

Both agreements were signed for the United States by Ross E. Moore, Assistant Director of the Office of Foreign Agricultural Relations, and for the respective Latin American governments by Rodolfo V. Morales, Minister of Agriculture of El Salvador, and José M. Zelaya C., Minister of Agriculture and Labor for Nicaragua.

▲ Synthetic Rubber From Grains Is in Prospect

In addition to work on the development of natural rubber sources in the Americas, scientists of the Department of Agriculture are investigating commercial possibilities of manufacturing synthetic rubber substitutes from grains, according to testimony before a subcommittee of the United States Senate by Secre-

tary of Agriculture Claude R. Wickard.

This was good news in both North and South America, where in certain areas the accumulation of surplus corn and wheat is one of the pressing economic problems, although Mr. Wickard pointed out that present grain surpluses are well in excess of the amounts that could probably be used for synthetic rubber production in the near future.

Said the Secretary: "About 80,000,000 bushels of wheat or corn would be required to produce 200,000,000 gallons of alcohol, which in turn could produce 220,000 tons of butadiene. This would make approximately 240,000 tons of synthetic rubber. That is the approximate volume of synthetic rubber which could be obtained from grain through existing distilling plants, converted to high-proof alcohol production by the use of a minimum quantity of critical metals. Beyond production of about 240,000 tons of synthetic rubber, processing facilities would be a limiting factor."

▲ Growing Hog Industry in Argentina Reported

The growing of hogs in Argentina, a relatively new agricultural industry for that country, is reported thriving because of the low price of corn and the heavy export demand for pork. While Argentina does not rank among the largest hog-production nations in the world, it is believed hog production will continue to expand so long as there is a large corn surplus and pork prices are high.

During the first three months of 1942, Argentine hog marketings reached 377,300 head compared with 270,800 head in the corresponding quarter of 1941. There was an even greater increase in exports of pork and lard. The principal factor in the increased export movement is a contract for shipment to the United Kingdom of 88 million pounds of frozen boneless pork during the year ending September 30, 1942. This is considerably greater than the country's exports of all kinds of pork to all countries during the period 1935–39.

Indications of the trend in Argentine hog production are based largely on pork product marketings and on reports of an increase in the number of gilts and sows being bred, since the latest official report available on hog numbers is for 1938. At that time Argentina had 3,381,000 hogs and was second to Brazil among the Latin American countries. At the same time the United States had more than 44,000,000 hogs, a number that has since increased to more than 70,000,000.

▲ Rotenone Root Survey Is Started

A program to encourage the increased production in the Amazon Valley of high-grade rotenone-bearing roots has been undertaken by the governments of Brazil and the United States. The first step is a preliminary survey of wild rotenone plant resources of the Valley, which is being made by agricultural scientists of the two countries.

In the party are Dr. W. Andrew Archer of the Bureau of Plant Industry and E. C. Higbee of the Office of Foreign Agricultural Relations, both of whom are experienced in agricultural exploration and production in Latin America. The men arrived early in June at the Instituto Agronómico do Norte in the city of Belém, Brazil, which is headquarters for the survey.

Rotenone, one of the most potent insecticides in use today, is contained in the roots of certain wild plants of the tropics. The principal commercial source of the poison has been derris root, grown under cultivation in the Far East. Latin America, which knows the plants variously as barbasco, cube, and timbo, has ordinarily supplied somewhat less than half of the United States imports of the roots, harvesting them from the wild state and from plantings of largely unimproved stock. The object of the present project is to encourage cultivation of high-yielding roots.

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AGRICULTURE IN THE AMERICAS ROBERT H. INGRAM, EDITOR

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Jesús María Troncoso

OUR MUTUAL FRIEND

The Dominican Republic, which occupies the eastern two-thirds of the Caribbean island called Hispaniola, has had a see-saw career. Site of the first permanent European settlement in the New World, it grew up as a tranquil Spanish colony, was ceded to France and then returned to Spain, and in 1821 became an independent nation after expelling its Spanish governor. Later there came a period of Haitian domination and a short recurrence of Spanish rule, but the Dominicans have been independent continuously since 1863.

Under Secretary of State Sumner Welles of the United States says of this small Latin American country: "There has been no republic of the American continent whose inhabitants have fought more nobly against greater odds to maintain their freedom than have the Dominican people."

Steeped in the tradition of these people and their nation is Dr. Jesús María Troncoso, who represents the Dominican Republic in Washington today as its Minister to the United States.

The son of the former President of the Republic, Dr. Manuel de Jesús Troncoso de la Concha, he was born in Ciudad Trujillo, the national capital, attended its Normal School, and received the degree of Master of Law from the University of Santo Domingo.

He has occupied such public positions as Secretary of the Land Claims Office; Secretary of the Dominican Legation in Santiago, Chile; Professor of the University of Santo Domingo; Under Secretary of the Presidency; member of the Advisory Committee of the Foreign Office; and Under Secretary of State.

On September 23, 1941, when Dr. Troncoso presented his credentials as Dominican Minister to the United States, President Roosevelt greeted him with these words: "I am gratified by the message which you bring that the Dominican people and government share the ideals of the people and government of the United States of America, as well as their faith in the principle of hemispheric solidarity in the defense of the Americas and of our continental heritage and liberty."

Inter-American Cooperation in Agricultural Education

(Continued from page 122)

brought into being a number of emergency projects, such as those dealing with rubber, quinine, fibers, oils, and other vital products that are urgently needed.

Other problems being worked on by this committee are: the training of personnel and technical and economic research in both tropical and temperate-zone forestry; the establishment of agricultural advisors in several of the American countries to work in the field on technical agricultural problems; and better provisions for the dissemination of technical information by the publication of texts, bulletins, and journals in Portuguese and Spanish and by wider use of radio and film. The problem of human nutrition under peace as well as war conditions, the place of engineering and its integration in agricultural development, the handling of surplus crops, possible extension organizations—all these are among the problems receiving attention.

The outbreak of war with its emphasis on strategic materials, the shortage of transportation, and limitation on travel have served to intensify rather than diminish the committee's activities. Any permanent post-war plan must include adequate recognition of and provision for sound agricultural development in all the Americas. Education in this direction is basic, and it is with the furtherance of this objective in all its phases that the committee is concerned.

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IN THIS ISSUE

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NAMES & NEWS

Attaché to Cuba

An addition to the corps of agricultural workers in Latin America is *Paul G. Minneman,* recently appointed by the Department of State as agricultural attaché of the United States Embassy in Havana, Cuba. In 1941, Mr. Minneman served with a United States technical mission that surveyed the resources of Cuba for the government of that country and made recommendations of methods suggested for diversifying Cuban agriculture. Since then he has been on assignment to the Department of Agriculture for research on the American tropics.

The new appointment brings to five the number of agricultural attachés assigned to State Department missions in Latin American capitals. The others: *Paul O. Nyhus,* Buenos Aires; *Erwin P. Keeler,* Rio de Janeiro; *Lester D. Mallory,* Mexico City; and *Charles L. Luedtke,* Panama City.

Tingo María Head

Director of the Peruvian agricultural experiment station now being established at Tingo María will be *Benjamin J. Birdsall,* Department of Agriculture soil scientist. A native of Wisconsin, Dr. Birdsall served on the Central American agricultural staff of a United States firm from 1929 to 1936, then returned to the States for graduate study at Michigan State College. Since last November, he has been with the Department of Agriculture as a member of the Ecuadoran Economic Resources Mission. The Tingo María station is based on a United States-Peruvian agreement signed in April.

Development in Ecuador

To stimulate the economic development of Ecuador, a corporation called the Corporación Ecuatoriana de Fomento was formed in Quito late in June as a cooperative effort of that country and the United States. Quito newspapers promptly shortened the name to CET, gave the event banner headlines, termed it a national milestone.

Authorized to develop and improve agriculture, mining, industry, and transportation, CET will give immediate attention to beginning or increasing the production in Ecuador of such war materials as rubber, fibers, vegetable oils, and drug plants. It will also give attention to rehabilitating the production of high-quality cacao, of which Ecuador was once the world's leading supplier. For these programs, it will use information gathered by the Ecuadoran Economic Resources Mission, a group of Department of Agriculture technicians who recently completed a 6-month assignment in the country.

At the request of the Office of the Coordinator of Inter-American Affairs, the corporation will launch development and rehabilitation of the agricultural province of El Oro, which was confirmed as a part of Ecuador in the recent boundary settlement with Peru.

It will also cooperate in the establishment of

{Continued on page 160}

Agriculture IN THE *Americas*

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Chocolate Grows on Trees

The cacao bean, raw material of chocolate, has been a major agricultural commodity for more than 400 years. It provided early Americans with a favorite beverage, but today the Western Hemisphere ranks behind the Eastern Tropics as a producing region.

by BERTHA MERDIAN

Aztec Emperor Montezuma, so legend has it, would take no other beverage than "chocolatl," served from golden goblets with spoons of tortoise shell. Modern users are less particular about the trappings, but millions of them share the emperor's high regard for this valuable food product that grew in tropical America long before the coming of Europeans to the new world.

Raw material of chocolate and of the wide variety of chocolate products consumed in the world is the cacao bean, for which there is no substitute. The cacao tree is a native of the coastlands of the Gulf of Mexico and tropical South America, and is grown commercially only in the tropics. From the bean are derived liquid chocolate, the powder called cocoa, and cocoa butter, which in turn are used in the manufacture of candy, bakery goods, beverages, and flavorings.

Since the United States, much the largest user, must import its entire supply, cacao ranks high among the leading complementary agricultural products imported into this country. In most years it is surpassed only by coffee and bananas among agricultural imports from Latin America. This fact gives cacao a prominent position in any plans to improve inter-American agricultural and commercial relations.

Although cacao originated in the Americas, production now centers in Africa. Latin America furnishes around a third of the world supply and about half of the United States imports. Considerable attention is currently being given to increasing the cacao production of the Western Hemisphere as a means of stimulating inter-American trade and lessening dependence on the eastern world.

The importance of cacao in the traditions and legends of early America can be judged by the frequency with which it is mentioned by Spanish American chroniclers, particularly those who wrote of Mexico. Some of its early food uses seem strange and not too appetizing. The beverage of the Aztecs was made of the whole cacao bean coarsely ground with corn or some other cereal and mixed with spices and flavoring. Another recipe, found in a Spanish book of 1631, called for cacao beans, chili peppers, anise seed, vanilla, cinnamon, almonds and sugar, ground fine and mixed into a homogeneous mass.

The beans also served as a medium of exchange. In discussing the products of the new world, an early writer said of cacao: "It is the best merchandise that is in all the Indies. It goeth for money in any market or fair, and may buy flesh, fish, bread, or cheese, and other things." Cacao beans were among the curios which Columbus took to Europe, but it was another adventurous Spaniard, Cortes, who saw commercial value in the strange seeds. Spain became the first European country to use cacao, and, it is said, monopolized the industry on the Continent for years.

Cacao Goes Around the World

By the early part of the 17th century the beverage had become popular in France. Later it was adopted in Germany and England. About this time the frequenting of coffee houses was passing from the fashionable folk to the populace, but the use of cacao was limited to the wealthier classes by the fact that it cost the equivalent of three dollars or more a pound. Many of the chocolate houses later became famous clubs such as White's Chocolate House adjoining St. James Palace and the Cocoa Tree Club of Picadilly.

To keep pace with the increased demand cultivation of the cacao plant was rapidly extended throughout the tropical countries of the Western Hemisphere and to

other areas as well. By 1560 cacao beans had been carried half way round the world and planted in the East Indies. Some time in the latter 16th and early 17th centuries, the plant was introduced into Fernando Po and Principe, two small Portuguese islands off the west coast of Africa. It was the presence of cacao on these islands that led to its cultivation in the vast areas of West Africa, destined to become the world's largest source. About 1800 cacao was planted on the island of Madagascar, and 30 years later in Ceylon. Now the tree is distributed over a great portion of the tropical world.

Chocolate was first made in the United States in 1765, in a mill on the Dorchester side of the Neponset River at a point known as Milton Lowell Mills. The raw cacao beans were then brought into this country by New England traders, especially the Gloucester fishermen who received them in exchange for the articles which they supplied to the countries of tropical America. As early as 1790, imports of raw cacao into the United States amounted to more than 500,000 pounds. By 1900 the quantity was averaging more than 20,000,000 pounds, and from that point imports increased rapidly, reaching about 680,000,000 pounds by 1940.

A Universal Favorite

Because the flavor of chocolate is almost universally liked and because the product lends itself well to many confectionery and culinary products, its use has increased greatly throughout the world. Since the start of the present century, world consumption has increased more than sevenfold, reaching a peak in 1939 of more than 1 billion 700 million pounds. The United States absorbs approximately 40 percent of the total world supply. According to the Bureau of Census, the value of basic chocolate products manufactured in this country averaged more than 96 million dollars annually between 1925 and 1937. Per capita consumption in the United States increased from less than 1½ pounds in 1910 to nearly 5 pounds in 1941.

Elsewhere in the Americas, use of cacao preparations is general, although the volume consumed is not great, and most of the tropical countries supply their own needs except for some imports for flavoring purposes. Important consumers in Europe are Great Britain, which in normal times took more than 15 percent of the annual raw cacao supply, and Germany, the Netherlands and France, which imported somewhat smaller quantities.

The great Swedish botanist, Linnaeus, esteemed cacao so highly that he designated the genus yielding the product as Theobroma, or "food for the gods." There are numerous species, all producing cacaos of somewhat different qualities. In general these may be grouped as forastero, the ordinary or base cacaos, and criollo, the finer grades for flavoring. Differences in grade and quality of the beans are caused not only by differences in species but by particular properties of the soil and climate in the producing countries and to some extent by the care with which the beans are cured and processed. Most chocolate manufactures contain both ordinary and fine grades, blended in accordance with manufacturers' formulas. Base grades account for approximately 85 percent of the world crop.

This Is How Cacao Grows

Although cacao is generally known as a plantation crop, a large portion of the world harvest is gathered on small-acreage farms. The tree, a perennial, attains a height of approximately 40 feet in its native state, but under cultivation it is usually kept at from 15 to 25 feet to produce a more fully developed fruit and for convenience in caring for the tree. It comes into bearing when about 5 years old, attains full productivity in its eighth year, and under favorable conditions continues to bear from 30 to 80 years.

The fruit or pod is attached directly to the trunk or large branches, and varies in size from 6 to 10 inches in length and 3 to 5 inches in diameter. When ripe it may be yellow, maroon, or crimson tinged with purple, and its leathery rind is filled with a pulpy mass in which are embedded rows of seeds. Each pod contains from 20 to 50 seeds, which after passing through a curing process of fermentation and drying, constitute the raw cacao beans of commerce. The beans resemble almonds, although they are less pointed, and their paper-like skin or shell contains two oil lobes which constitute the food substance of the bean.

The time of major harvesting of the crop varies in the individual producing countries. The heaviest arrivals on the world markets occur between October and February, and smaller quantities are received in midsummer or early fall.

When received by the manufacturers the raw cacao beans are ready for roasting, after which they are crushed lightly and the kernels or "nibs" are separated from the shells. The roasted nibs, constituting approximately 85 percent of the weight of the bean, contain about 50 percent fat, which when extracted is known commercially as cocoa butter. The butter is remarkable for its freedom from rancidity and its bland character. It has many uses in pharmaceuticals and toilet preparations, but by far its greatest consumption is in the manufacture of chocolate confections. Both nibs and shells contain small quantities of theobromine, used for medicinal purposes and in the manufacture of caffeine. Chocolate liquor, as it is known to the trade, is obtained by prolonged grinding of the nibs, resulting in a plastic fluid which solidifies on cooling. Cocoa powder is obtained from the

Pan American Union photo.

This is how cacao pods grow. The picture was made in the State of Bahía, Brazil.

Courtesy Hershey Chocolate Corporation.

A bag of dried cacao beans ready for shipment from the Island of Trinidad.

Courtesy National Geographic Society.

Drying cacao beans in Ilheos, Brazil. At the rear are roofs, which run on rails so that they may be drawn over drying beans to protect them from rain.

press cake remaining after part of the butter has been removed from the chocolate liquor by hydraulic pressure or other means.

Cacao in Latin America

Until about 1900 tropical America produced more than 80 percent of the world cacao crop. By 1925, however, the center of production had shifted to West Africa, where there were extensive areas suitable for the crop. The decline in the relative position of Western Hemisphere cacao in the world market was probably caused largely by the fact that the supply of ordinary cacaos from the Americas fell behind the rate of world consumption, while the supply of finer grades, in which several American countries specialize, has been in excess of requirements.

Although its share in world trade has shrunk, Latin America has increased its total production of cacao. South American production has risen almost 50 percent in the last decade, and there has been some increase in the Caribbean area. In certain areas, however, particularly in northern South America and parts of Central America, extensive damage has been done by the plant diseases, witch's broom and pod rot. Since little can be done to control the diseases, it is essential that disease-resistant trees be developed for planting in the affected areas.

Brazil is the second largest world source of the product, accounting for around 15 percent of the total supply. It is the country's third most important agricultural export, exceeded only by coffee and cotton. Most of its production is of base grades, and the United States has taken about 80 percent of the exports in recent years. The crop has approximately doubled in the last decade and reports indicate that the upward trend is continuing.

The Cacao Institute of Bahía has accomplished a great deal toward improvement of the industry in Brazil. Created under government supervision in 1931 to regulate cultivation, grading, and marketing of cacao, the Institute has helped planters by giving financial assistance and providing improved storage facilities. It is supported by a tax on all cacao exports from the State of Bahía, which ships about 90 percent of the amount exported from the country.

In the early development of the cacao industry Ecuador ranked among the foremost world sources in both quality and volume. Production did not keep up with the expansion in other countries, however, and during the last 15 years it has not varied greatly. Most of the crop is produced on large estates.

Because cacao is Ecuador's leading export, often termed the barometer of its business and economic activity, development of the industry has been encouraged by government financial aid to growers and assistance in conducting experiments for the control of plant disease. Rehabilitation of the high-quality cacao industry in Ecuador was one of the objectives of the Ecuadoran Economic Resources Mission, a group of Department of Agriculture technicians who recently completed a survey of the country.

Other important South American producers of cacao are Venezuela, whose Caracas ranks among the finest grades, and Colombia, which has doubled its production in the last 10 years but still must supplement its supply with imports because of the wide use of cacao products within the country.

The West Indies, Central America, and Mexico furnish about 10 percent of the world supply of raw cacao. In the Dominican Republic and the British West Indies, the major producers of this area, production is primarily for export; the Central American republics and Mexico contribute little to the world supply but all of them have considerable production for home consumption and the crop is important in each country's domestic economy.

The Dominican Republic, ranking sixth among cacao-exporting countries, has been an important source for 30 or 40 years. The country maintains annual production at a level of about 50 million pounds, chiefly of a base grade known commercially as "Sanches."

Cacao was of minor importance in Costa Rica until recent years, when its cultivation on abandoned banana plantations was undertaken. A United States firm has done extensive work in improving varieties, and a limited expansion of acreage seems likely. Much of the Costa Rican cacao is of high quality.

In Cuba cacao is primarily a domestic crop, Havana chocolate manufacturers taking approximately 95 percent of the crop. Haiti produces between 3 and 4 million pounds a year, about half of it for export. The cacao crop has been considered of secondary importance, but the government-sponsored agricultural development corporation formed in Haiti last year is hopeful of increasing the value of the crop by encouraging more careful preparation to bring about a rise in quality.

Mexico was once an important source of cacao but now supplements its small production with imports. Nicaragua has a relatively small exportable surplus, but the product is of fine quality. Outstanding work in cacao plant breeding in the Caribbean area has been done by the Imperial College of Agriculture on the British Island of Trinidad.

Wartime Troubles

The war had little effect on the chocolate industry of the Western Hemisphere through the end of 1941. United States imports from both Africa and Latin America increased, and the portion of the American

Photos by T. A. Fennell.

Two steps in the handling of cacao in Haiti: (left) a farmer brings his crop to market; (right) breaking the pods and removing the beans preparatory to fermentation.

crop that ordinarily went to Europe was easily absorbed.

Since the United States entered the war, however, the situation has changed. Because of shipping conditions, cacao imports from Africa have been curtailed sharply and those from Latin America may soon be restricted. Since chocolate is an important and useful concentrated food, imports will probably be maintained in as large quantities as possible, but it is doubtful that the civilian supply of chocolate products can be kept up to normal under continued war conditions.

Total production of cacao in Latin America ordinarily has been equal to only about three-fourths of the requirements of the United States. Unlike rubber, vegetable oils, and some other crops cacao does not grow wild to any great extent and a substantial increase in the annual crop would require extensive new plantings that would not mature in less than about 5 years. Any prospect for an immediate increase in the supply of raw cacao from Latin America, therefore, appears to rest on a more thorough harvest from existing plantings and on a more careful preparation for the export market of the cacao harvested.

Before the war disrupted normal trade, the consumption of chocolate in the industrialized areas of the world was on the uptrend, and there was no indication that the saturation point had been reached. It seems logical to expect that the prewar trend will be resumed after the war, particularly if the previously negligible demand from Russian and Asiatic markets can be increased.

If the ravages of cacao diseases can be overcome, there appears to be a favorable opportunity for Latin America to supply the world market with more cacao than it has in recent years. It has extensive areas well suited to the crop, and cacao planting is ordinarily one of the most profitable of tropical industries, yielding relatively high returns on a comparatively low investment.

OTHER PUBLICATIONS ABOUT CACAO—

"World Cacao Production and Trade," by the author of the above article, appeared in the February 1941 issue of *Foreign Agriculture*, published by the Department of Agriculture. Surveys of the cacao industry in Brazil and Costa Rica by Elizabeth Keithan appear in the April 1939 and January 1940 issues of the magazine *Economic Geography*. A New York Cocoa Exchange pamphlet called "Understanding the Cocoa Market" was published in 1938.

A comprehensive publication in Portuguese is "A cultura de cacao na Bahía," by Gregorio Bondar, published in 1938 as a technical bulletin of the Instituto de Cacao of the State of Bahía.

The June and July 1941 issues of the *Boletín* of the Departamento de Agronomía of the State of Manabí, Ecuador, contain basic studies in Spanish on cacao cultivation and disease control. The July issue also contains an article, "Sobre el saneamiento del cacao," by Porfirio Lozana H., who discusses methods of improving cacao production in the coastal regions of Ecuador. "El cacao y su cultivo," by Oscar Samayoa Mendez, appeared in the October 1940 issue of *Revista Agrícola*, published by the Departamento de Agricultura of Guatemala. The Departamento de Agricultura y Ganadería of Colombia devoted the entire August 1941 issue of its publication *Revista Agropecuaria* to a study by Gonzalo Henao Londoño of cacao cultivation in Colombia. A recent discussion in Spanish is "Replantación del cacao," written by E. J. Pound of the Imperial College of Agriculture in Trinidad and published in the July 1942 issue of *La Hacienda* of New York City.

'New World' Wheat Agreement

Three American nations and two of their close associates elect the way of cooperation as a cure for the economic ills of wheat. This summary indicates what that choice may mean to wheat in the agriculture of the Americas, both now and after the war ends.

by GORDON P. BOALS

The announcement on July 2 of the approval of an international Memorandum of Agreement concerning wheat may be regarded as the first step toward a world wheat marketing agreement. It also points the way to a more stable future for wheat in the agriculture of the Americas, for three of the signers, Argentina, Canada, and the United States, are American nations, and the others, Australia and Great Britain, are closely identified with the Americas.

The three Western Hemisphere nations and Australia signed as wheat exporters; the United Kingdom, as an importer. Among them they account for the greater part of the world trade in wheat. Since July 10, 1941, representatives of the five countries have had a series of meetings in Washington, D. C., at which they drafted the new understanding.

The agreement represents a choice between two courses of action that were open to the world wheat trade, and particularly to the major exporting countries, in determining the future of one of the Western Hemisphere's most important crops. One alternative was to continue the old method of individual competition, with each exporting country trying to secure as large a share of the market as possible by any means available. The other was to adopt the new way of international cooperation and agreement, a principle that had already been applied in the case of coffee and sugar. The agreement is a decision in favor of the latter method—a decision which may come to be known as the "Washington Charter" for wheat growers and consumers the world over.

The views of the five countries regarding an international wheat program suited to normal conditions of world commerce are presented in a document known as a Draft Convention. This has been recommended for consideration by an international wheat conference to be convened at a later time, when other nations that have a substantial interest in the international wheat situation will be able to attend.

Because nothing akin to normal trade in wheat can be expected while the war lasts, the five countries signed the Memorandum of Agreement, a document which sets forth procedure to be followed during the war and the immediate post-war period. Under this Memorandum, certain provisions of the Draft Convention go into effect immediately, including the following:

(1) The establishment of a Wheat Council to administer the provisions of the agreement. Headquarters will be in Washington, D. C., until otherwise decided.

(2) The adoption or maintenance on the part of the four exporting countries of positive measures to control production, with the object of minimizing the further accumulation of excessive stocks during the war.

(3) The establishment of a pool of wheat to be available for inter-governmental relief in war stricken countries and in other food-deficient areas of the world, where circumstances in the view of the five signatory governments make relief practicable.

In order to prevent disorganization and confusion immediately after the war, the Memorandum of Agreement also provides for bringing into operation for a limited period after hostilities end certain provisions of the Convention relating to control of production, stocks and exports and to stabilization of prices. The Memorandum is to remain in effect up to 2 years after the end of the war or until it is superseded by an agreement reached at the proposed wheat conference or by any other arrangements the five countries and other interested nations may make to deal with the period pending such a conference.

The framework and objectives of the Draft Convention can be indicated by citing a few of its 17 articles, without any attempt to review the document in detail.

One of the principal goals is to bring about an expansion in world trade in wheat. Under Article I, the signing countries agree that it is essential to the solution of the world wheat problem "that consumers should have the opportunity and means of increasing their purchases of wheat from areas which are equipped to produce it economically." They agree further that realization of this objective depends "not only on the lowering of barriers to the importation of wheat but also on making available to wheat importing countries increased outlets for the exportation of goods which they in turn are equipped to produce economically."

The Article then goes on to a strong endorsement of "national and international policies aimed at a fuller

and more efficient use . . . of human and natural resources," and pledges the contracting governments to further the attainment of these objectives in every way possible. The Wheat Council is directed to submit from time to time information about the international wheat situation in order that the contracting governments may consider what measures may be adopted in this direction.

Another objective of the agreement, stability of supplies and prices, is dealt with in Articles II. III. and IV. which contain provisions on production control, stocks and export control. These call for a condition that is already familiar to wheat growers of the United States as the "ever-normal granary"—a stabilizing of the wheat industry at a level which will assure adequate supplies for domestic needs, basic export quotas and prescribed reserve stocks. The particular methods by which this objective may be achieved are left to the individual countries to decide.

Orderly shipments into world trade after the war are provided by assigning to each of the exporting countries a percentage share of the total amount of wheat exported by all four of them, the shares taking into account both previous export history and expected future surpluses. Export percentages agreed upon for the post-war period are: Argentina, 25 percent; Australia, 19 percent; Canada, 40 percent; and the United States, 16 percent. These percentages, of course, apply only to commercial transactions; relief wheat would be handled separately.

Former practices of dumping wheat and breaking the market in order to move a larger volume will be outmoded under the export quota provisions and under Article V, which provides for a minimum and maximum level of prices for export wheat. The experience of the 1930's showed that extremely low wheat prices help neither exporting nor importing countries. Not only do they reduce the purchasing power of the exporting country for imports of needed goods from other countries, but they cause most importing countries to adopt protective measures to aid domestic producers against foreign competition, thus nullifying any important advantage to consumers from cheap wheat.

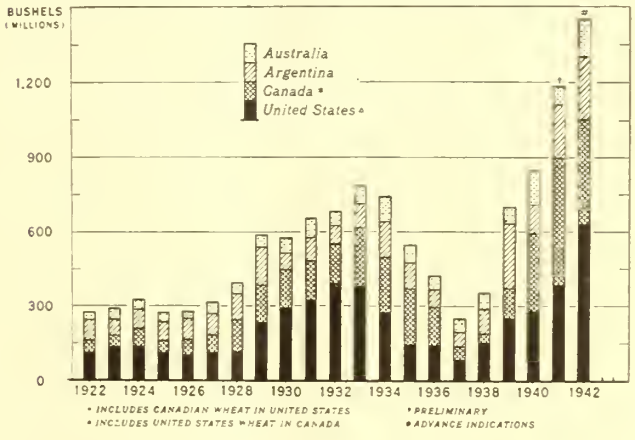
In determining the level of wheat prices each year under the agreement, the Council is given four guideposts, namely, that they be such as to (*a*) return reasonably remunerative prices to producers in exporting countries; (*b*) be fair to consumers in importing countries; (*c*) be in reasonable relationship to prices of other commodities; and (*d*) make appropriate allowance for exchange rates and transportation costs. Obviously such a price level will be a compromise, but it should provide considerable stability to the international grain market and afford protection both to producers and consumers.

The establishment of a relief pool of wheat, which begins immediately under the Memorandum of Agreement, is covered in Article VI of the Draft Convention. This provision calls for the use of some of the prevailing large supplies when they will be most needed and by people who are unable to obtain wheat otherwise. The effects of this international humanitarian effort may be far-reaching. Food relief following the war is expected to be needed in such volume that an organized international undertaking of this character will be required to handle it.

As the new wheat program goes into effect, the wheat farmers of the Americas and of the world are faced with these outstanding facts:

(1) *Record wheat stocks on hand.*—It is estimated that on July 1, 1942, the four countries, Argentina, Australia, Canada, and the United States, had on hand approximately 1 billion 450 million bushels of wheat, the distribution of which is shown in the chart accompanying this article. This is a quantity equal to 2 to 3 years world

ESTIMATED WHEAT STOCKS IN FOUR MAJOR EXPORTING COUNTRIES AS OF JULY 1, 1922-41, AND INDICATION FOR 1942



wheat import requirements without making allowance for new crop surpluses in the meantime. The accumulation of surplus stocks has been particularly rapid since the outbreak of war in 1939. The large surpluses have created serious storage problems and much wheat must now be stacked out in the open.

(2) *Reduced wheat imports.*—A wheat crisis appeared to be in the making in 1939 with crop outturns exceeding annual consumption and disappearance. The war and blockade rapidly accentuated the abnormal situation. Countries which need wheat to the point where they are facing starvation conditions are cut off from the enormous wheat supplies in the Americas. Since imports of wheat have dropped to new low levels, surpluses in the exporting countries are piling higher and higher. Statistics show that the amount of the reduction in probable imports since 1939 closely approximates the increase in surplus stocks. With each season that passes, of course, wheat

needs for that season pass. Surpluses accumulate but demand does not.

(3) *Government programs and aid.*—As wheat has piled up far in excess of export demand and has overtaxed storage space, producers, unable to carry the full burden, have turned to their governments for assistance. Since wheat occupies an important place in the economy of each of the exporting countries, it has been necessary for each government to consider ways and means of handling the problem. At first the programs adopted were regarded largely as temporary expedients, but as the war has gone on, the need for a longer range plan and program has become increasingly evident. Even so, no one country has been willing to adopt a more nearly permanent wheat program without some assurance as to probable developments in competing countries.

Until the present agreement was signed, wheat seemed likely to be faced with an explosive competitive situation in the post-war period. The prospect was for the continued accumulation of surpluses in the Americas and Australia in excess of the normal market demand, which after the war would be still further affected by lack of buying power in the principal importing countries. If each country should endeavor to compete with the others for the limited outlets, markets would become disorganized, prices would drop to unprecedented levels, export subsidies would be increased, importing countries would be forced to adopt new protective measures to prevent the collapse of their agriculture, and a new wheat war of the first magnitude would be under way. The country with the greatest economic resources would no doubt win, but the peace would be lost.

The agreement is the wheat world's answer to the challenge of this dismal outlook. It is a charter which will enable the leading wheat producers of the Americas and other regions of the globe to build a more stable agricultural economy, to iron out some of the peaks and depths of the fluctuations that have characterized prices and shipments of wheat and affected the national incomes of many countries. A solution of the "problem of wheat" should go far toward solving other national and international problems as well.

Temporary storage erected in Canada to hold some of the Western Hemisphere's wheat surplus.

READING About the Americas

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Hispanoamericanos, Willis Knapp Jones and Miriam M. Hansen; 270 pp., Henry Holt and Company, New York, 1941. A portrayal of Latin American life through selections from stories by Spanish American writers, with explanatory material concerning authors selected.

The Haitian People, James G. Leyburn; 342 pp., Yale University Press, New Haven, Conn., 1941. Deals with the people of Haiti, their religion, home life, politics and economics, and present-day problems. Extensive bibliography.

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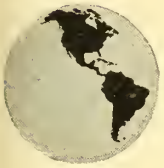
Builders of Latin America, Watt Stewart and Harold F. Peterson; 343 pp., Harper & Brothers, New York, 1942. A series of biographical chapters divided into historical periods, followed by study aids and pronouncing glossary.

South America with Mexico and Central America, J. B. Trend; 128 pp., Oxford University Press, New York, 1941. A story of Spanish and Portuguese colonization, followed by description of social conditions, literature and arts and a chapter on Pan Americanism. Illustrations and maps.

Something About Spices

In olden times spices were essential, and they are important in modern menus. The Far East is the world's spice chest, but the war has created Western Hemisphere interest in the many condiment plants that could be grown profitably in the American tropics.



by E. C. HIGBEE

The discovery of America must have seemed slight compensation to the 15th century European mariners who found the continent blocking the long-sought new route to the spices of the Far East. In those days, when smoke and salt were all that man had to preserve his food from decomposition and high seasoning was often required to make meats palatable, spices were preferred to gold.

The Americas, although they made many contributions to the world's diet, adopted Europe's taste for the condiments of the Far East. Today, in an age of refrigeration and tin cans, spices are not so important as of old but they remain a piquant addition to modern menus and it is a matter of general concern when the principal producing areas are cut off from world trade as they have been by the present war.

Of course, pantry shelves of the Americas will be adequately supplied with spices for the next 2 or 3 years from large stocks in warehouses, but the combination of reduced imports and higher prices will no doubt cause a few people to experiment with the long neglected native spices of the myrtle, laurel, citrus, and other aromatic plant families. Many victory gardeners may plant herb gardens of parsley, marjoram, sage, dill, and thyme.

United States farmers have already moved to prevent shortages of the most important spices that can be grown in temperate areas. Last year, anticipating a need for mustard seed, they produced enough to last 3 years. Should future prices be sufficiently encouraging, they will probably grow all of the caraway, coriander, and other condiment seed field crops the domestic market will require. Most of the leading spices, however, are tropical crops that cannot be grown in the United States. Greatest Western Hemisphere enthusiasm, therefore, will probably develop for producing in the tropical portions of Latin America condiment plants which have hitherto been brought from regions thousands of miles away.

Perhaps the leading example of a native American spice that made good in the face of competition from the East Indies is allspice, produced by a member of the myrtle family. Its peculiar name is derived from the fact that its fragrance and taste curiously resemble a mixture of all three of its chief rivals, cinnamon, clove,s and nutmeg.

To this day wild trees in the countries of the Caribbean, particularly in Jamaica, are the principal source of this spice. Most of the beautiful Jamaica plantations have been established by clearing brushland to permit the development of allspice seedlings which grow from seed scattered by birds. Allspice trees, or pimento as they are often called, have a span of life longer than man. They commence to bear at 7 to 10 years of age and when mature yield about 100 pounds each of dried spice a year.

The pimento is an ornamental evergreen that grows on shallow limestone soils in Mexico, Guatemala, Costa Rica, Venezuela, Haiti, and the Dominican Republic, as well as in Jamaica. The cultivation of a few trees on a small farm in areas where it is adapted would require little labor that a family could not spare. The tree offers one of the best cash returns of any spice crop.

While few Eastern spices became established in the Western Hemisphere, the cultivation of native American capsicums spread around the world. Capsicums are the familiar pod-shaped peppers, and the kinds are almost infinite, ranging from the succulent and sweet bell pepper to the hottest tongue-scorching Mexican bird chili. Some of them are strictly tropical; others grow far to the north and south.

The commercial production of capsicums, largely for use in the fresh form, has always been a profitable enterprise in the Americas, but most of the favorite household spices derived from them are produced in the greatest quantities outside the Western Hemisphere. The nonpungent paprika, one of the best known of these spices, has been prepared in Hungary by removing the sharp-tasting core and grinding the pod only of one variety. Cayenne and other pungent red peppers are produced from the dried pod, seeds, and pith of other capsicums.

Another American native is vanilla, which ranks among the most difficult to produce and prepare of all the spices. The success of the Totonaco Indians of Mexico in cultivating this valuable delicacy is an inspiration to all small farmers in the American tropics who wish to raise spices. The production of the vanilla orchid, a true horticultural art, was practiced before the days of Cortes by this tribe of Indians, who prized its aromatic

beans as a flavor for their favorite beverage, chocolate. To this day the Totonacos are the most important producers of this spice in the Western Hemisphere. The story of how vanilla production drifted away from the Hemisphere and of the efforts to restore it to the Americas has already been told in these pages ("The Story of Vanilla," *Agriculture in the Americas*, February 1942).

One of the first Asiatic spices brought to the Americas for commercial cultivation was the ginger plant. By 1547 it was grown in such quantities in Jamaica that more than 22,000 pounds of its dried underground stems were sent to Spain. To this day ginger is one of the most important condiment plant introductions being grown in the Western Hemisphere. It is said that the soils and climate of many Caribbean countries are unsurpassed for the production of this adaptable and easily cultivated plant that yields 700 to 1,500 pounds of dried spice per acre in 1 year.

Pepper, Black and White.

Although black pepper is the most important of all spices in terms of total value and extent of production, it is not grown in the Western Hemisphere. Commonplace as pepper is today, there was a time when only kings and the wealthiest nobility could afford its use. In Rome during the first centuries of the Christian era it was measured out on balances for its equivalent weight in gold. Perhaps nothing which we eat has had a history as long and turbulent as the tiny clustered fruit of the pepper vine. Many bitter wars were fought for the control of the East Indies which, at one time, were more valuable for this spice than for rubber and oil.

Black pepper is ideally suited to small-scale production. If planting material were available, it could easily be grown and dried on the family-size farms of the American tropics. In the Far East it was grown for centuries by small-scale farmers as a cash crop with which to pay land rent. While a 3-year wait is necessary before a crop worth picking is obtained, pepper vines have been known to live and produce well for 25 to 30 years. A useful bearing life of 10 years is common.

The pepper plant is easily propagated by seeds or cuttings. Often, instead of erecting stakes or trellises, the vines are started at the base of trees on which they climb for support. Shade trees in coffee plantations are sometimes used for this purpose. The mango, betel nut, and even the kapok tree, all productive themselves, have been used as living supports of the pepper. Annual yields of the vines vary; 5 or 10 pounds of spice from each is a common return. Where they are planted close together on poles, an acre will produce 2,000 to 4,000 pounds of dried fruit each year. White pepper is obtained from the same vine by picking the clusters of fruit before they are quite ripe, soaking them in water and finally removing the black outer rinds before drying and grinding.

The sweet inner bark of the cinnamomum trees has always been highly regarded for both its flavor and its fragrance. At the funeral rites of Nero's wife Poppaea, the Roman emperor is said to have burned, as an incense, more cinnamon than could be imported in a year's trade with India. While true cinnamon bark has a more delicate flavor than its close relative *Cinnamomum cassia*, greater quantities of the latter are grown and sold at a cheaper price. Both are among the hardiest of spice trees. On any well-drained soil the cinnamon will sometimes grow 40 feet tall with a trunk 2 feet in diameter. The wild cassia is larger, frequently reaching 50 feet in height with a trunk 5 feet through. The dried flower buds of the Chinese *Cinnamomum cassia* are the common spice we call cassia buds.

Under modern cultivation methods the cassia and cinnamon trees are made to grow like bushes. When 6 or sometimes only 2 years old, the whole tree is cut off near the ground. From the stump develop sprouts that are cut back every 2 years in the same way. The thin, dried bark of these tender shoots produces the sweetest quills. Enough cinnamon of fine grade has been grown successfully in French Guiana to prove that there are areas in the Caribbean suitable for the cultivation of this important spice.

The history of cinnamon furnishes an excellent example of the vigorous efforts that have always been made to guard the established spice-producing areas from competition. The Dutch were the first to cultivate cinnamon, making their earliest attempts in 1767. To guard their interest in the tree when they were in control of Ceylon, it was made a crime punishable by death to take seeds away from the island. Such tactics, employed with other spices as well, made it almost impossible for farmers of other tropical regions to obtain either planting materials or markets, a fact which largely accounts for failure of spice production to become established in the Americas.

The Versatile Clove

Perhaps no other spice but cinnamon is as versatile as cloves. Not only have these tiny dried flower buds been highly regarded for their flavor and aroma since very ancient times but they are of importance today as the source of clove oil which is used medicinally and in soaps, perfumes, and ointments. Eugenol, an ingredient of clove oil, is a basic material from which synthetic vanilla extract is manufactured. It also serves as a lure in Japanese beetle traps. Ground cloves are sometimes used in the manufacture of cigarettes because of the delicate fragrance they impart to the tobacco.

Sweet and mild as cloves are in flavor, they have had a turbulent career. The Portuguese were the first to discover them growing in the Molucca Islands of the East Indies. Later the Dutch drove the Portuguese from those rich spice gardens and, in order to supervise the cultivation of their treasure more closely, destroyed all the wild trees they could find except on Amboina and Ternate which they guarded carefully. In the years 1769 and 1771 French expeditions under the direction of Governor Poiure of Mauritius managed to find some trees overlooked by the Dutch in their scorched-earth operations. From Mauritius cloves were introduced to Zanzibar and Pemba off the eastern coast of Africa where 80 percent of the world's supply is grown today. They were also brought to the West Indies and were grown successfully on the Island of Dominica according to a planter who introduced them in 1791. His trees came into production 4 years after planting and the quality was said to be equal to the best. His plantations did not prosper, however, because of heavy duties levied on Dominican spices by European importers.

Clove trees are easily grown by the small farmer who can spare the land. Little time and labor is required in the orchard except at picking time. Exceptional clove trees have been known to produce well at 150 years of age. The average tree yields about 7 pounds of spice a year and 50 may be planted to the acre.

Nutmeg and Its Partner

One of the most popular spices is the seed of the nutmeg tree. A native of the Moluccas, it is found today in the Western Hemisphere in the West Indies and Brazil. It has been said of the nutmeg that it will not grow beyond sound of the sea; also that it is a carnivor and must be fed flesh. That is a dramatic way of pointing out that the nutmeg grows better at the lower altitudes to be found along shore lines and that it requires rich soil which may be made more fertile by manuring with fish or meat scraps.

In the nutmeg tree, male and female flowers are borne on separate plants. Since grafted trees do not develop well, seedlings must be planted with only hope that most will be female and but a few will be the necessary but unproductive male. When once established, a good grove will average 1,500 to 2,000 nuts or approximately 15 or 20 pounds of kernels per tree annually. Special mention has been made by horticulturists of individual trees which have produced 10 times as much in a single year.

In the days when the Dutch sought to limit the production of nutmeg to the Moluccas they destroyed the germinating power of the kernels by soaking them in lime. To this day it is sometimes assumed that limed nutmegs are of superior quality. Better tests of fine quality are to determine whether or not they are heavy for their size and whether or not oil will form when the surface of the seed is scratched with a fingernail.

Nature did a master work in designing the nutmeg kernel, packing it in 2 shells and separating them with a sweet, membranous mesh which is the more valuable spice known as mace. It is not a solid coat but a lace of pulp which varies in amount according to the species of nutmeg and the locality in which it is grown. Several hundred pounds of nutmeg will sometimes have but a single pound of mace attached. Often the ratio is 10 of the kernel to 1 of mace. When the whole nutmeg fruit is gathered and the pithy outer shell which opens like a clam is removed, the mace is separated by hand from the surface of the inner shell and is carefully dried in the sun or in ovens.

Cardamon—Handle With Care

The jungle herb cardamon has a seed that is one of the most subtly aromatic and expensive of the spices. Fortunately for the Americas a large quantity of cardamon is grown in Central America, particularly in Guatemala. Few spice plants must be handled with greater care than the cardamon. Its tiny seeds are contained in paper-thin capsules that guard against exposure to the air which would gradually rob them of their mild flavor. From the time each featherweight capsule is individually snipped with scissors from the plant until it is used by the housewife in her pastry and curries, the cardamon is handled with more than kid-glove care.

Potential cultivators of unfamiliar spice plants in Latin America face several problems. One of these is the danger that after the war Far Eastern spices may flood the market at lower prices just long enough to put the new producers out of business. Likewise, it is certain that trained scientific assistance will have to be available to growers so that they will use only the best planting materials and cultural methods and select only the best soils and locations for their new enterprises. Experience in the Far East has shown that such help is essential to avoid expensive failures.

Neither of these difficulties is great but they must be recognized. One method now being used to protect new growers of some other Latin American products is for the United States to guarantee a minimum price based on cost of production for amounts of produce raised within the limits of hemispheric needs. It is believed that crops planted on this basis will have a more secure future than those grown for uncertain export outlets which may be dammed up at any time. Given some such assurance, spice production is fully in line with the current interest of the American republics in restricting the production of surplus competitive crops in favor of complementary ones.

Venezuela Is a Paradox

Oil made Venezuela rich but it has contributed to the high cost of living that makes many of the people poor. Most Venezuelans are farmers, however, and agriculture is becoming increasingly important as a factor in the health and wealth of the nation.

by KATHRYN H. WYLIE

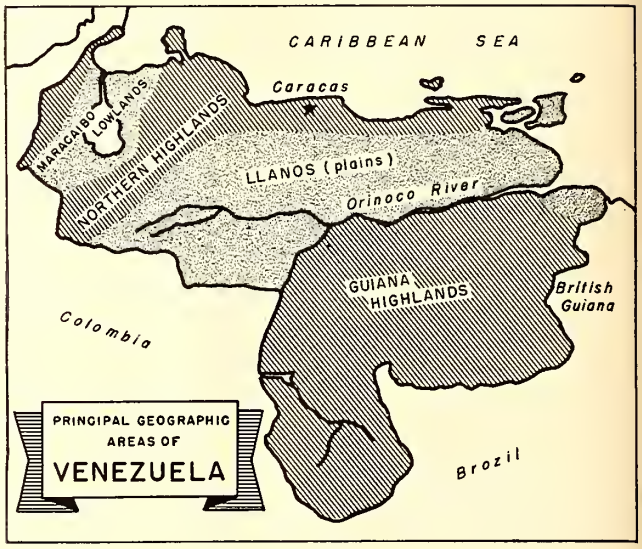
Venezuela, the birthplace of South America's great liberator, Simón Bolívar is a country of natural grandeur, with many and varied resources. Petroleum gold, diamonds, and fertile soil give it great national wealth and an enviable financial position, yet the cost of living is so high that many of its people live in poverty.

Christopher Columbus saw the American mainland for the first time when he touched the shores of what is now Venezuela at the mouth of the Orinoco River in 1498. A year later Amerigo Vespucci, for whom America was named, christened the new country Venezuela, or "little Venice," because the natives built their homes on stilts in Lake Maracaibo, where today oil derricks dot the surface and draw up black gold from beneath the water.

Site of the first permanent Spanish settlement in South America, Venezuela was also the first of the Spanish-American colonies to try for freedom. Early attempts to form an independent nation failed, but on July 5, 1811, Venezuela formally declared its freedom at a congress of elected delegates, and 12 years later Bolívar led his colonial army to victory. Venezuela first became a province of the nation of Greater Colombia, but since 1830 it has been an independent republic.

This triangle-shaped country on the northeast corner of South America is half again as big as Texas, with a long coastline on the Atlantic Ocean and the Caribbean Sea. Like most of the other countries of Latin America, its life has been profoundly affected by mountains, which cut across the country in two broad bands and divide it neatly into four distinct geographical areas.

In the northwest section of the country is a hot lowland basin surrounding Lake Maracaibo. South and east of this region rise the Northern Highlands, made up principally of an Andean range that extends into the country from neighboring Colombia. To the south are llanos, 130,000 square miles of level plains that are parched and thirsty in the dry seasons and flooded during the rains. Most of the southern half of the country is occupied by the Guiana Highlands, a primitive, largely unexplored region that contains extensive forest resources, as well as many beautiful waterfalls. One of the falls, on the Caroní river, is three times as high as Niagara.



The Orinoco, third largest river in South America, flows northeastward between the llanos and the Guiana Highlands from Colombia to the Atlantic.

Politically, Venezuela is divided into 20 states, 2 federal territories, a federal dependency, and a federal district. Most of its 3,500,000 people live in the Northern Highlands, where the climate is pleasant and the soil is fertile. Near the north border of the Highlands, a few miles inland from the Atlantic, is the national capital, Caracas, a mountain-encircled metropolis of more than 200,000 people. The second city is Maracaibo, the oil center with half the population of the capital. Nine other cities have populations of more than 15,000. There has been little immigration into Venezuela and 80 percent of its people are of mixed Spanish and Indian blood.

The mountains have given Venezuela scenic beauty and tempered its tropical climate, but they have also imposed a transportation problem that is one of the country's chief economic handicaps. It is so difficult and expensive to build highways and railroads that much travel and shipment of goods are still done by mule pack in many areas. The Transandean Highway is the most important road, connecting Caracas with Bogotá, the capital of Colombia, and crossing the Andes at an altitude of 14,000 feet. The Caracas-Valencia railroad demonstrates the difficulty of railroad building

in Venezuela; it has 86 tunnels and 230 bridges in 175 miles of track.

Venezuela has extensive deposits of gold, silver, and diamonds, but by far the most important of its mineral resources is petroleum, in the production of which it is surpassed only by the United States and the Soviet Union. Petroleum has been produced for many years and during the middle 1920's the industry began an expansion that has made it the dominant influence in the national economy. Today it represents almost a third of the country's wealth and accounts for 80 percent of the value of exports. The oil has been developed for the most part by foreign capital and profits from its sale are largely exported, but heavy taxes are collected from the industry to pay the costs of government and to aid agriculture. Oil made it possible to wipe out the foreign debt completely by 1930, and only a small amount of debt has been contracted since then.

The development of agriculture in Venezuela has been retarded by the heavy reliance on oil as a source of national income and by several other conditions. On many of the mountain farms, farmers have removed the forest cover from steep hillsides, goats have cropped the remaining vegetation, and continuous cultivation has exhausted much of the land. About 40 percent of the country's farmers live on small pieces of eroded land that will not yield an adequate diet for their families. Even where there is plenty of fertile land, scarcity of labor and machinery and primitive methods of cultivation tend to limit production. During the last dozen years the oil fields have drawn many workers from the farms.

As a result of these forces among others, Venezuela today must import much of its food from other countries. It produces enough corn and sugar for most of its needs, but has to import wheat flour, fats and oils and rice, as well as a great variety of other food products. A high tariff policy designed to stimulate increased food production has served instead to raise the price of necessities, and the high exchange value of the currency (Venezuela still holds to the gold standard) helps make living costs higher than in any other Latin American country or even in the United States. It is startling to the uninformed visitor to be charged almost a dollar a dozen for eggs and three or four times as much as he would have to pay in the United States for lard, sugar, and flour. The same situation extends to consumer goods other than food. In the fall of 1939, for example, an automobile that cost $867 in Washington, D. C., sold for $1,559 in Caracas.

Despite these conditions, Venezuela is basically a farming country, with the agricultural and livestock industries representing 40 percent of the national wealth. The richest agricultural land of the country is in the

Courtesy World Petroleum

Oil wells dot the surface of Lake Maracaibo. In this basin most of Venezuela's petroleum is produced.

Soil erosion is a serious problem in Venezuela. This eroded hillside is in the San Rafael region.

mountain valleys of the Northern Highlands, particularly around the cities of Caracas and Valencia. Coffee and good quality cacao are the chief export crops, and corn, beans, manioc, sugar, plantains, bananas, wheat, and rice provide the major foods. Corn is grown on a wider scale than any other crop, and sugar ranks first in value of production.

Coffee production amounts to about 150,000,000 pounds a year, a total that gives the country third place among Latin American producers in most years. Before the great increase in petroleum production, coffee made up between 40 and 60 percent of the value of all Venezuelan exports. The quantity has been declining recently, and there is little immediate prospect of an increase, since Europe took around three-fourths of the country's coffee shipments in normal times.

Where the Coffee Grows

Half the Venezuelan coffee crop is grown on small farms in the Northern Highlands. Yields are low, averaging only a half pound of coffee per tree, and the quality is not uniform. The coffee berries ripen from September in the lowlands through December and January on the mountains. About half of Venezuela's coffee is processed by the "dry" method, where berries are sun-dried and then put through machines to remove the outer covering. The "wet" process used on the rest of the berries is more expensive, but in general it yields coffee of better quality. The berries first go through a machine to remove the outer pulp, from there into fermenting vats to dissolve the remaining coating, then through a washer and on to cement floors to dry.

Cacao production of between 30 and 40 million pounds a year is also largely for export. It is produced in the State of Miranda in the Highlands, in Sucre, and at the delta of the Orinoco. New oil fields in the delta region, however, are drawing workers from the cacao plantations.

Corn is the principal food of Venezuela as it is of most American countries. Every state and probably every farm produces some corn, but the largest producing region is south and east of Lake Maracaibo. The States of Trujillo, Falcón, Lara, Portuguesa, and Miranda produce half the total crop. Storage is a major problem in these areas where weevils and other insects multiply rapidly and destroy corn stored in sacks within 3 months. Rice, another staple food, is produced in all but two states. It is a small-farm crop, and the production of about 15 million pounds must be supplemented by imports of nearly half the rice consumed.

The warm interior valleys and the hot coast country are particularly well suited to sugarcane. White sugar production is concentrated in the State of Zulia, which produces half of the total, but panela, a brown sugar sold in cake form, is produced in all states for local use. Panela is more important in the local diet than white sugar.

Manioc and beans grow in the Northern Highlands and the coast regions, and bananas and plantains in Zulia and on the north coast. Wheat production, largely in the State of Mérida, supplies only 20 percent of the country's requirements. Potatoes, native to the Andes, grow in Mérida and Trujillo, but domestic production satisfies only half the need for this product. Cotton and tobacco production usually supplies the local textile and tobacco industries, but in 1939 and 1940 heavy imports of cotton were necessary because of the short crop. Cotton yields are low and quality is not uniform.

The cattle industry has been important to Venezuela since Colonial days, both for supplying domestic meat consumption and for the exportation of live animals and hides. Good grazing lands are available, especially in the llanos, and conditions are favorable for expanded cattle development. Annual slaughter of about 300,000 head furnishes most of the domestic beef requirements.

Goats, numbering about 615,000 in 1936, graze on the steep hillsides of the Northern Highlands, cropping the sparse grass and contributing to the erosion of the soil. They furnish meat and milk on many small farms. The 355,000 hogs counted in 1936 were scattered pretty well over the country. Lard production averages about 1,500,000 pounds a year and must be supplemented by imports of lard and other fats and oils.

In addition to its cultivated crops, Venezuela has extensive wild resources in its forests, particularly in the Guiana Highlands. There are found rubber, balata, chicle, tonka bean, mahogany, divi-divi, copaiba, and cusparía trees, all of which yield products of commerce. For the most part forest products are gathered by Indians who float them down the rivers to market.

A new era for the farming and laboring people of Venezuela began on July 16, 1936, when a new federal Constitution opened the way for labor and social security legislation and for improvements in education, agriculture, and land settlement. Basic labor legislation was enacted in 1938, and a social insurance system was set up in 1940. A new policy of agricultural assistance, proclaimed on December 21, 1935, provided for subsidies to coffee growers, and export bounties were later extended to a wide range of products. The Banco de Venezuela has authority to buy coffee and cocoa for the account of the Treasury to relieve producers. Certain of the bounties have now been eliminated and export assistance changed to a premium on foreign exchange.

The government has shown an increasing recognition of the fact that there is a great need for measures that will reduce the reliance on imports for food and other farm products. Free seeds have been distributed and credit has been furnished for small farmers. In November 1941 the Ministry of Agriculture started a campaign

to increase the production of oilseeds, and a joint stock company was formed to develop the native fiber, fique, for the local manufacture of coffee bags. A beginning has been made on reforestation, a forest patrol has been established, and the public is being educated on the value of forest cover for the land. Free public markets have been established in several towns, and the government plans to extend them throughout the republic.

The Ministry of Agriculture recognizes the need for a larger agricultural population and encourages land settlement. Several colonies have been established with carefully chosen immigrants, and during 1938 a Technical Institute of Immigration and Colonization was set up to aid immigration.

As a result of the war, preparations have been made to develop local resources and production and to adjust the country's economy to wartime needs. The National Price Control Commission, which has been regulating consumer prices, is now authorized to assure producers a minimum return on their products and to coordinate transportation facilities. Plans also have been proposed both for the long-time development of resources and for immediate action to increase output.

The government has developed a skeleton staff that could serve as the framework for more intensive training of farmers and better utilization of resources. Students are being sent to other countries to learn improved methods, and experimental farms have been established in various parts of the country to serve as models, as well as to perform necessary experimental work on livestock and plants. Schools of agriculture and animal husbandry and of veterinary medicine were established near Caracas in 1938, and there are several other new schools to train foremen and managers of coffee and cacao farms. Government experts in livestock and crop production travel through the country to give advice and report on crop and weather conditions. Agricultural clubs in many places are starting educational programs.

U. S.—Venezuelan Trade

Increased cooperation between Venezuela and the United States promises many mutual advantages. A trade agreement between the 2 countries was signed November 6, 1939. The United States granted concessions on 14 items, including crude and ground barbasco root, tonka beans, orchid plants, cacao, coffee, and balata. Venezuela granted duty reductions on wheat flour, lard, apples, grapes, and pears, a number of dried fruits, canned or bottled fruits and vegetable preparations and agreed to the binding of existing duties on prepared milk, crushed and rolled oats, hams and canned pork, bacon, oat flour, and pork sausage.

The United States has long been the principal supplier of Venezuelan imports, furnishing half the total before

Contour plowing and correct irrigation layout at the Maracay Agricultural College in Venezuela.

the war and about four-fifths in 1941. Statistics show the United States as the second most important market for Venezuelan exports, although shipments to the leading market—the Netherlands West Indies—consist largely of oil for refining and reshipment to other areas, chiefly the United States and Great Britain. The United States is thus probably the largest market for Venezuelan products.

Although food crops, meat, and dairy products are most important for the local diet, there are many commodities that could be developed for complementary trade with the United States. The government-controlled Compañia Anónima Bananera Venezolana has a concession of 15,000 acres along the Yaracuy River for the production of bananas. A new fiber plant established in the State of Táchira may prove that fique can be developed for profitable production of bags. Other fibers grow wild in the country, and sisal and abacá could no doubt be produced if transportation were available. Oil palms are now growing in the forests ready for capital to develop them and move their products to market. Considerable increase is possible in the production of other forest products, including rubber, lumber, copaiba, divi-divi, balata, and vanilla.

Venezuela is sincerely interested in the improvement of its national agricultural welfare. Its greatest needs are for technical advice and assistance in bringing about the desired changes. A staff of trained rubber technicians from the United States is already working to increase rubber production in the region south of the Orinoco, and a group of United States Department of Agriculture specialists recently completed a study of the soil conservation problems of the country. These and other surveys and studies provide a framework for planning an agricultural program to increase the living standards of the Venezuelan people, as well as to provide products for inter-American trade.

ALONG THE *Agricultural Front*

▲ Abundant Hemisphere Rice Supply Seen

Indications are for an abundant 1942–43 rice supply in the Western Hemisphere, according to a report compiled by the United States Department of Agriculture. The report indicates that, if this year's rice crop in the Hemisphere turns out as expected, supplies will be sufficient to meet normal Hemisphere requirements of 5 billion 200 million pounds, and to allow at least 400 million pounds for lend-lease use and stockpiles.

In South America, as a result of favorable weather and acreage expansion, more countries will have a rice surplus this year than at any time in previous history, it was stated. For the continent as a whole, the net export surplus should amount to at least 250 million pounds. The Caribbean countries constitute the largest rice deficit area of the Hemisphere, with annual net import requirements of from 700 to 800 million pounds. Central America is a deficit area to the extent of only about 20 million pounds.

The United States was reported as having record crop prospects; Mexico is said to have ample supplies from the 1941 crop; and Canada has been obtaining its needs from Brazil, Mexico, and the United States.

▲ Army Buys Buttons Made From Tagua Nuts

The United States Army is reported to have purchased 2,592,000 buttons made from "vegetable ivory," a product of the tagua nut of Ecuador. The buttons are valued for military purposes because they withstand cracking under pressure and intense heat and remain colorfast through numerous washings.

▲ Bolivia to Have New Sugar Factory

Plans have been announced in Bolivia for the construction at Santa Cruz of a sugar mill that will have a capacity of some 4,000 tons a year. The machinery has been purchased from an Argentine firm, and it is hoped to begin operation of the plant this year. Bolivia now depends on imports for a large part of its sugar needs, which amount to more than 25,000 tons a year, but is anxious to cut down on this deficit. Sugarcane can be grown successfully in many parts of the country.

▲ Comptroller Appointed for Dominican Rice

The Dominican Republic recently established the office of Rice Comptroller to supervise its important rice industry. The comptroller is to counsel the national executive on all matters relating to limitation of rice exports, equitable distribution of the export quota among producers, and price stabilization. The new office has no authority over the cultivation and preparation of rice, features which are supervised by the Department of Agriculture.

▲ Agricultural Bank Created in Bolivia

An agricultural bank has been created in Bolivia by a decree of the national government. Its functions are to organize exchanges for agricultural and industrial products; buy raw materials and semiprocessed agricultural products for distribution to industry; import seeds, fertilizers, purebred livestock, raw materials, machinery, and tools for farming purposes; and buy and sell foreign currency.

▲ Peru Grants Loans to Better Food Situation

The Industrial Bank of Peru has been empowered to grant loans for improving the country's food supply and shipping facilities. Loans under this authorization will be used to open new foodstuff plants and enlarge existing ones and also to increase the number of ocean and river vessels used in supplying domestic food needs.

AUTHORS in This Issue

Authors of all articles appearing in this issue are members of the staff of the Office of Foreign Agricultural Relations.

AGRICULTURE IN THE AMERICAS ROBERT H. INGRAM, EDITOR

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Héctor David Castro

OUR MUTUAL FRIEND

Among the public men of Latin America who have contributed in the last few years to the effort for improved inter-American agricultural relations, few have been more active than Dr. Héctor David Castro, Minister to the United States from the Republic of El Salvador.

In 1940, when a project for an inter-American institution for agricultural research reached the stage that made detailed planning necessary, the Governing Board of the Pan American Union appointed representatives of 10 of the republics as a committee to handle the task. Named chairman of that committee, Dr. Castro has supervised with energy and tact the international arrangements that are expected to be climaxed soon by the establishment of the Inter-American Institute of Agricultural Sciences.

Dr. Castro entered public life by way of the law. Soon after taking the degree of doctor of law and political and social science, he became district attorney in his country's national capital, San Salvador. He went on to service on the bench and later entered the administrative branch of the national government, which he has served as Undersecretary of Finance and War, Undersecretary of Foreign Affairs, Director General of the Income Tax Bureau and, most recently, as Minister of Foreign Affairs. In 1933 and 1934, he was Dean of the University of El Salvador.

Appointment as Minister to the United States in 1934 placed Dr. Castro in charge of his country's Legation in Washington for the second time. From 1923 to 1927, early in his public career, he headed the Legation as Chargé d'Affaires ad interim after having joined the staff 3 years earlier as secretary.

In addition to his diplomatic work in the United States, Dr. Castro has been Salvadoran consul in Liverpool and Minister to Uruguay. He has also been prominent at most of the inter-American conferences of recent years, serving as delegate to the Havana conference of 1928, president of El Salvador's delegation to the Montevideo conference of 1933, and personal representative of the Minister of Foreign Affairs at the Rio de Janeiro conference in January of this year.

Names and News

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an experiment station under a plan similar to that recently adopted for agricultural experimentation in El Salvador, Nicaragua, and Peru (*Agriculture in the Americas,* June and July 1942.)

The corporation will operate under a line of credit of $5,000,000 from the Export-Import Bank of Washington. All stock is owned by the government of Ecuador.

Officers are: *Vincente Illingworth,* Minister of the Treasury of Ecuador, president; *Augusto Dillon,* President of the Bank of Guayaquil, Ecuador, vice president; *Eric F. Lamb,* former United States economic adviser to Paraguay, general manager; *Edwin R. Kinnear,* formerly of the United States Department of Agriculture, assistant manager; and *Alfonso B. Larrea* of Ecuador, secretary-treasurer.

Mr. Illingworth, Mr. Dillon, and Mr. Lamb are directors, along with *José Chiriboga,* Secretary to the President of Ecuador; *Ross E. Moore* of the Department of Agriculture; and *William A. M. Burden,* vice president of the Defense Supplies Corporation.

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IN THIS ISSUE

September 1942

Conference Sidelights

(Some informal notes about the Second Inter-American Conference of Agriculture and the people who attended it. A story about the significance and work of the Conference begins on the facing page.)

By a late change of plans, the Conference was held not in Mexico City's Palace of Fine Arts, as originally scheduled, but in Chapultepec Castle, which was built in 1783 during the colonial period and was renovated during the 1860's as the home of Emperor Maximilian and Empress Carlota. Situated in an expansive park on a hill overlooking the city, it is one of Mexico's most striking buildings.

Five ministers or secretaries of agriculture attended: *Dr. Andrés Rivero Agüero* of Cuba, *Maurice Dartigue* of Haiti, *Marte R. Gómez* of Mexico, *General José María Zelaya* of Nicaragua, and *Claude R. Wickard* of the United States . . . National directors of agriculture present were *Eduardo Mejía Vélez* of Colombia, *Leopoldo Barrientos* of El Salvador, *Mariano Pacheco y Herrarte* of Guatemala, *Edgardo Valenzuela* of Honduras, and *Eduardo Morillo Safa* of Mexico . . . Also among the delegates were two members of national congresses, *Senator Carlos Barreda* of Peru and *Representative Richard Kleberg* of the United States. Representative Kleberg, who lives in Texas, was the only United States delegate to address the Conference in Spanish . . . An unexpected unofficial Conference visitor was *Manuel Prado Jr.*, son of the President of Peru.

Language differences were handled smoothly, thanks to the skilled linguists provided by the Mexican government as translators. Under the rules of the Conference, each question or remark in Spanish or English had to be translated into the other language before discussion could proceed. Most of the formal papers and addresses had been translated in advance and were available for distribution at the time they were given.

Eight of the delegates had represented their countries at the First Inter-American Conference of Agriculture in Washington in 1930. They were *Wilson Popenoe* of Honduras; *Julio Riquelme Inda* and *Pascual Gutiérrez* of Mexico; *H. H. Bennett*, *E. W. Brandes*, *B. Y. Morrison* and *O. E. Reed* of the United States; and *José L. Colom* of the Pan American Union. Dr. Popenoe, incidentally, represented two countries this time. He was an official delegate of Honduras, where he is now residing, and a consulting delegate of the United States, of which he is a citizen.

Alberto M. Candiotti, Argentine Ambassador to Mexico and head of this country's delegation, joined Secretary Wickard in a radio broadcast after the closing session. The program was broadcasted nationally in the United States and carried by short wave to Latin America . . . Ambassador Candiotti also spoke for the delegates at the opening session, acknowledging the address of welcome by Pedro de Alba, Assistant Director of the Pan American Union . . . The delegates' valedictory at the closing meeting was given by the Brazilian delegate, *Walldemar Raythe de Quiroz e Silva*, Director of the National School of Agriculture in Rio de Janeiro.

The shortest speech of the Conference was made by President *Avila Camacho* of Mexico. Introduced at the close of a long opening session after the delegates had heard three hours of speaking, the President said: "I declare this Conference convened"—and sat down to enthusiastic applause. On the closing day, he returned for his formal address, a masterly summing up of hemispheric conditions . . . In addition to attending the Conference, General Avila Camacho held an official reception for the delegates, as did *Dr. Ezequiel Padilla*, the Secretary for Foreign Affairs, and *Ambassador George S. Messersmith* of the United States.

Only woman delegate was *Dr. Hazel K. Steibling*, nutritionist from USDA's Bureau of Home Economics, who noted a vivid contrast between the wide variety of foods

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Agriculture IN THE *Americas*

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Agricultural America Mobilizes

Accomplishments of the Second Inter-American Conference of Agriculture, where representatives of all 21 republics explored the field of agriculture in the Western Hemisphere, with emphasis on filling wartime needs and meeting post-war conditions.

by RALPH H. ALLEE

Western Hemisphere agriculture has been linked to the war effort more firmly than ever before by the Second Inter-American Conference of Agriculture, which closed July 16 in Mexico City. Ten strenuous days of planning left little doubt that the agricultural leadership of the Americas is fully awake to the situation facing agriculture today and to the implications for the future.

The Conference, arranged by the Mexican government, was originally scheduled for October but was advanced in order to spur concerted action on the many agricultural problems growing out of the war. In spite of transportation troubles and the change in date, 170 delegates attended and all 21 American republics were represented.

Prominent in the discussions were rubber, vegetable oils, fibers, insecticides, and other farm commodities strategic to the war effort. Cotton, wheat, sugar and coffee were considered, both in regard to normal efforts to manage these hemispheric surpluses by international agreements and to special situations created by transportation difficulties and loss of markets.

While all the problems discussed could not be settled, many points of agreement were reached. Equally important is the fact that those who are concerned with farm problems in the various republics became acquainted with the men who are similarly engaged elsewhere in the Americas. Conditions under which all are working became better understood, and the foundation for mutual helpfulness was strengthened.

In the opening plenary session, after constructive remarks by Ingeniero Marte R. Gómez, Mexican

Delegate Walldemar Raythe de Quiroz e Silva, Brazil, addresses final Conference session. Seated left to right at Speakers' desk are Pedro de Alba of Pan American Union; Secretary Wickard; Secretary Gómez, President Avila Camacho and Secretary of Government Miguel Aleman of Mexico; Minister Agüero of Cuba.

Secretary of Agriculture and chairman of the Conference, addresses were given by the two vice chairmen, Dr. Andrés Rivero Agüero, Secretary of Agriculture of Cuba, and U. S. Secretary of Agriculture Claude R. Wickard.

Dr. Agüero made a strong plea for governmental action in protecting the agricultural industries of the Western Hemisphere against the permanent establishment of synthetic substitutes of lower food value and inferior quality, mentioning as an example the increasing use of saccharine in place of sugar, made difficult to obtain by the war shipping situation. The implications of this paper were embodied in a resolution of the Conference after a discussion indicating that the delegates generally saw the problem presented as somewhat wider than the mere protection of the agricultural income of certain countries. There was substantial agreement with the view that agricultural production of a given product brings about a more satisfactory social situation than production deriving largely from industrial processing.

Report to the Hemisphere

A good share of Secretary Wickard's address was a report to the Hemisphere on the war effort of the United States with particular reference to agriculture. His succinct statement of adjustments made in the economy of the United States to convert non-essential industrial production to the production of war materials and the shift from surplus agricultural products to the protein- and vitamin-rich foods required by the United Nations drew praise from the delegates and in the Mexican press. Equally well received was his frank appeal to the other republics for collaboration in the production of strategic commodities formerly imported from the Far East.

"Our Conference faces two chief problems," Secretary Wickard said. "The first requires immediate action: What must agriculture do to assure and hasten victory? The second is no less important: How can we best lay the foundations of a post-war agricultural economy, a plan for better living standards in every country, and for healthy trade relations among ourselves and with the rest of the world?"

Measures advocated by the Secretary included: Agreements or contracts to increase production of strategic commodities, cooperative agricultural experiment stations, improvement and integration of communications, plans for farm and industrial labor, common management of surpluses, provision for relief after the war, finding ways of distributing maximum production to the people, raising more crops for home consumption, and the strengthening of our competitive positions as a Hemisphere by better production methods, higher yields, mechanization, improved transportation and new processing techniques.

"Both for the present and the future," Mr. Wickard concluded, "the United States Department of Agriculture offers to the representatives of other nations, and especially to the nations of the Western Hemisphere, the services of its scientists, economists, engineers and technicians, and the facilities of its laboratories and experiment stations."

The work of the Conference was carried on in 12 subject matter sections, which had been outlined by the organizing committee and revised by the Pan American Union in accordance with the suggestions of all the American republics. At the section meetings and at the various plenary sessions, more than 70 papers were presented by representatives of most of the countries. These reports and the discussion they generated led to the adoption of 76 resolutions.

As might have been expected, the section on *Products of Present-Day Importance* received the most attention. It was attended by 32 registered delegates and many observers. After 21 resolutions had been presented for consideration on the first day, the work of the section was assigned to sub-groups specializing in rubber; vegetable and animal fibers; coffee, cocoa and yerba maté; aromatic, medicinal and insecticidal plants, and woods including balsa; meats, grains and oil-bearing plants; sugar, fruits and vegetables; Chilean nitrates and other fertilizers.

Commercial Rubber Development

Outlining the rubber situation at a meeting of this section, Dr. E. W. Brandes of the United States Department of Agriculture said: "The time is ripe for building a permanent, self-sustaining plantation rubber industry in the New World, with the support and guidance of the scientific and technical experts of the American governments working in close association. Budwood of high-yielding clones, tested for resistance to leaf blight, and a storehouse of information on choice of trees and planting procedures are available. Through the cooperation of the U. S. Department of Agriculture and the agricultural services of the countries of tropical America, progress has been made in solving the biological and technical problems. The way is now paved for commercial development on a large scale."

He reported considerable development in commercial plantings throughout the American tropics, but emphasized the need for more "nucleus plantings" to serve as demonstrations and sources for planting materials and training opportunities. These would be of sufficient size to be economic self-supporting units. However, small growers will eventually become the backbone of the plantation industry, combining the growth of rubber with other crops. "The mutually beneficial inter-relations of plantations and family-size farms" have been amply demonstrated in the Far East, he said.

Secretary Wickard Says . . .

The Second Inter-American Conference of Agriculture impressed me as a demonstration of the will of the people of the Americas to live and work together.

Of greatest immediate importance, naturally, are the steps that were taken to make available agricultural products essential in carrying on the war. In addition, the Conference lost no opportunity to encourage projects that will have a long-time effect. Concentration on the war does not prevent us from laying the groundwork now for a new era in the post-war economic life of the Americas. With more than 60 percent of the people of the Western Hemisphere dependent on farming for their livelihood, agriculture is fundamental in any such plans.

The United States delegation, and I believe the representatives of every other country, returned home convinced that inter-American agricultural conferences ought to be held more often. The exchange of views and information that they involve will contribute to a happier, healthier and more prosperous life for all the people of all the American nations.

Out of this paper grew considerable discussion of the relation that should exist between emergency rubber production from wild trees and the establishment of a plantation industry. It was agreed generally that the investments and population movements required to produce wild rubber are most strongly justified if they mark also the founding of permanent communities to be supported eventually by Hevea plantations.

Interest in the permanence of war-stimulated agricultural developments in the largely uninhabited tropics of the Americas ran through many of the discussions. The Conference faced the issue squarely in its resolution with regard to Western Hemisphere rubber production, in which it recommended that American nations which produce and consume rubber "study the possibility of entering into bilateral or multilateral agreements so as to guarantee, under reasonable conditions, the disposal of continental production, thereby preventing a future shortage of such an essential raw material among the American peoples."

Papers on the fats and oils situation in the Americas by Dr. F. F. Elliott and Dr. K. S. Markley of the United States Department of Agriculture opened a series of discussions which finally resulted in an important resolution. This involved recommendations that the transportation of fats and oils from areas where they are in surplus be facilitated, that existing mainly wild sources of oil-bearing seeds of high lauric acid content be developed, that the cultivation of castor beans and other oleaginous seeds be increased, and that the relationship between established production and production for the emergency be recognized.

Other recommendations on products of present-day importance concerned increased production of tung oil, drugs, gums and resins, essential oils, fatty oils and waxes, insecticides, tannins, spices, and other flavoring materials, meats and cocoa. One resolution recommended that the Division of Agricultural Cooperation of the Pan American Union, in agreement with representatives of interested countries, establish cacao institutes in Ecuador and other American countries where cacao production is important. It was also recommended that yerba maté be encouraged as a substitute for tea.

From this section, too, came a resolution recommending that each American republic establish a service for the introduction of new plants and the exchange of plant materials with other countries, similar to that maintained by the United States Department of Agriculture. To facilitate this inter-American development, it was suggested that a correspondence and exchange center be established in the U. S. D. A. Division of Plant Exploration and Introduction. Mr. B. Y. Morrison, chief of this Division, explained the function of this service at a meeting of the section.

Other highlights of the discussion of present-day needs were a paper by Atherton Lee of the Board of Economic Warfare on the procurement of strategic agricultural commodities and one by L. A. Wheeler of the Department of Agriculture on problems of surplus control.

The section on *Statistics, Production, Transportation and Distribution* made headlines in the Mexico City papers with its treatment of food supply problems and the use of surpluses in improving nutrition. From papers presented by James D. LeCron of the Office of Inter-American Affairs and Dr. Frederick V. Waugh of the Department of Agriculture developed a resolution

recommending reduction of artificial restrictions on the interchange of products, substitution of crops required in improving nutrition for part of those now produced in surplus, and the adoption of cooperative and coordinated measures to bring about an equitable distribution of foodstuffs and other agricultural products among sectors of the population that need them most.

Credit System Proposed

Another important paper in this section, by Ernesto Fernández of the Paraguayan delegation, discussed the coordination and regulation of production. Resolutions were passed recommending the encouragement of agricultural producer associations, the development of agricultural accounting as a farm practice, the construction of rural centers for education, health and recreation, the solution of surplus commodity problems by international agreements, the introduction of adequate systems for the storage and preservation of farm products, further adherence of American countries to the Inter-American Statistical Institute, and the completion of the Pan American Highway.

In the section on *Commerce and Credit*, the technical and economic aspects of supplying credit facilities to farmers were presented by Ingeniero Bernardo R. Iglesias of Costa Rica, Julio Enríquez of the Dominican Republic and Dr. A. G. Black of the United States. The resolutions presented by this section recommended the establishment of systems of agricultural credit in countries not having such systems and the formation by the Pan American Union of a technical committee to make definite recommendations on the establishment of a bank to meet the agricultural credit needs of the continent.

The section on *Education and Research* divided its work into four parts: scholarships; the Inter-American Institute of Agricultural Sciences; publications; and research. Although few addresses were given before this section, several notable papers were available in mimeographed form. Among these were "Some Problems of Agricultural Education in Tropical America" by Dr. Wilson Popenoe of Honduras; "The Inter-American Institute of Agricultural Sciences" by Dr. E. N. Bressman of the Office of Inter-American Affairs; "Agricultural Science and the People's Welfare" by Dr. E. C. Auchter and "Inter-American Collaboration in Agricultural Research and Extension" by Dr. R. E. Moore, the latter two from the United States Department of Agriculture.

Resolutions were adopted recommending exchange of information concerning scholarships available in the respective countries, facilitation of the few arrangements still required to put the Inter-American Institute in operation, the publication of an inter-American agricultural magazine and the establishment of cooperative agricultural experiment stations.

The *Rural Organization* section included discussion of rural education of the vocational type, extension education, nutrition, public health and sanitation, population problems, agricultural policy and rural rehabilitation. The diversity of subjects included called for a maximum number of sessions of the section and several meetings of sub-groups on special topics. Papers on rural education and extension were presented by André Liautaud of Haiti, M. L. Wilson of the U. S. Department of Agriculture, Dr. J. C. Wright, of the U. S. Federal Security Agency and Ingeniero Emilio Gutiérrez Roldán of Mexico.

A resolution was passed recommending the adoption of integrated systems of rural education based on community life and including extension education reaching the farm and home, training courses for teachers of vocational agriculture and home making, and the use of the rural school as a center for rural programs.

Other resolutions passed at the suggestion of this section concerned scientific assistance to the Inter-American Institute of Indian Affairs, inclusion of home economics instruction and research in colleges of agriculture, the founding in the Pan American Union of a section of rural colonization, the improvement of rural housing, the development of rural electrification, protection of the agricultural worker, studies of food habits and food products, protection of the traditions and customs of rural life, and the study of the problems of rural life by interdepartmental committees.

A Hemisphere Soil Society

The section on *Soils and Agronomy*, to a greater extent than most of the other sections, brought together individuals with common interests and common problems, perhaps because the earth itself varies less in the problems it presents in widely separated areas than do its peoples. The detailed description of studies in soil fertility, drainage, erosion control, and ecology carried on in the Argentine Soil Institute, as presented by Ingeniero Antonio Arena of that country, might have been part of a similar paper given by Dr. W. H. Pierre of the Iowa Experiment Station. Similarly, Dr. Charles E. Kellogg of the United States Department of Agriculture presented a paper on "Soil Classification as the Basis of a Sound Agriculture," while Ingeniero Antonio Rodríguez of the Mexican Department of Agriculture, discussed the program under way in his country to classify all lands suitable for irrigation; Ingeniero Lorenzo Patiño of Mexico discussed the use of the maguey plant and other measures to arrest soil erosion, and Dr. H. H. Bennett of the United States Department of Agriculture delivered an address on "Conservation for Today and Tomorrow."

Inter-American projects discussed in this section

View of a plenary session of the Conference, with United States and other official delegates in the foreground.

included organization of a Hemisphere soil society, standardization of terminology, the supplying of fertilizers in tropical countries, and the making of a Hemisphere soil map. A series of significant resolutions was passed. Discussions brought out the fact that while North America is occupied with conservation of its soil, Latin America for the most part is still in the stage of land selection and exploitation—a situation that makes possible the application of North American experience to Latin American soil conservation problems.

Since cooperative efforts to control insect pests and diseases of crops and animals have extended over a period of years in this Hemisphere, the *Entomology and Plant Pathology* section assembled in Mexico found considerable unfinished business to transact. Although many of its problems centered around protecting war-important crops from damage, this group also found time to make constructive plans for the future. The migratory grasshopper is on the march, and papers by Abel Goytici and Pablo E. Kohler of Argentina and Dr. John R. Parker of the United States dealt with its control. Dr. Parker remained in Mexico after the Conference to assist in controlling 'hopper infestation in Yucatán.

Resolutions based on the discussions of this section covered control of pests on imported materials, the establishment in the Pan American Union of a plant quarantine section, parallel and coordinated investigations of insects in the countries of the Hemisphere, and standardization of quarantine measures, particularly in the supplying and propagation of new planting materials.

The *Forestry* section emphasized four principal themes: Development of adequate forest policies, including government control and assistance to private owners; the importance of developing forest resources, including surveys and studies to broaden utilization as a permanent foundation for forest industries; the strengthening of forestry education and research; and the influence of forests on the regulation of surface and subterraneous water currents for irrigation purposes.

Forest policies were discussed by R. E. Marsh of the United States Department of Agriculture and by Ingeniero Francisco Rodríguez Haro and Ingeniero Romero Quintana of Mexico. Research and teaching were covered in papers by Ingeniero Carlos Treviño of Mexico, Dr. Henry Schmitz of the University of Minnesota, and Dr. Arthur Bevan of the Department of Agriculture station in Puerto Rico. Ingeniero Aparicio Ranghel Galindo of Colombia presented the case for a more rational utilization and development of forest resources. Inter-American cooperation was emphasized by Ingeniero Sergio Barojas of Mexico and Dean Knowles Ryerson of the University of California. C. L. Forsling of the United States Department of Agriculture, although unable to attend the Conference, submitted a

paper on "The Role of Western Hemisphere Forests in the War and Reconstruction Following the War." Efforts throughout the Hemisphere to substitute wood for the steel needed in war industries paved the way for an enthusiastic reception of this report.

A comprehensive resolution was passed recommending action along the lines discussed by the foresters. Another resolution foresaw inter-American collaboration in determining and making known the extent of forest resources available for emergency needs and of possible contributions to normal trade.

Climate and the War

The *Climatology* section heard the relationship of climate o the war effort and to agriculture in general discussed by Ingeniero Alfonso Contreras of Mexico, Dr. C. W. Thornthwaite of the U. S. Department of Agriculture, and Dr. Charles F. Sarle of the Weather Bureau. Since variations in crop yields, in many parts of the Americas, is due more to weather than to any other single cause, the urgent need of climatological studies and facilities for weather forecasting was evident. A resolution of the Conference recommends collaboration on both short-range and long-range forecasts. Close cooperation is suggested betwcen phytophysiologists, phytopathologists and agrologists on the one hand, and meteorologists and climatologists on the other.

Animal Industry and Wildlife Preservation were considered in the same section. Papers on the improvemcnt of breeds and management were presented by O. E. Reed and Dr. A. O. Rhoad of the United States, by Ingeniero Alfredo Hernández of Costa Rica, by Ingeniero Ernesto Reza Rivera and Dr. Antonio Martínez Barragán of Mexico, and by Gabriel Arturias Moulton of Guatcmala. The currently important subject of livestock disease control and eradication was the subject of a paper by Dr. Adolph Eichhorn of the U. S. Department of Agriculture.

A resolution was passed on the establishmcnt of a single registry for each of thc existing pure breeds of domestic cattle and foreseeing closer cooperation between countries of the Hemisphere on standardization of registries and biological products, use of bulls genetically superior to the cows in use, thc use of artificial insemination, eradication of the cattle tick, the taking of a cattle census, and sytematic efforts to combat paralytic cattle rabies.

In the wildlife conservation division of this section, Ingeniero Romero Quintana of the Mexican Department of Agriculture, presented a paper on the control of predatory animals. A plan for protecting the vicuña was submitted by Ingeniero Augusto Valdivia Altamirano of Bolivia. Dr. Edward H. Graham of the Dcpartmcnt of Agriculture and Dr. Frederick C. Lincoln of the Fish and Wildlife Service discussed land management biology and wildlife management. A resolution of the Conference recommended provision throughout the Hemisphere for the study of wildlife and legislativc recognition of its implications for agriculture in appropriate legislation.

The need both for adapting agricultural products to new uses in the war effort and for utilizing normal surpluses occupied the interests of the section on *Chemistry and Technology*. The processing of grapes was discussed by Ingeniero P. Ricome of Peru and sugar technology by Ingeniero González Gallardo of Mexico. Ingeniero J. Acuña de las Vegas of Cuba submitted a paper on tung oil. Dr. R. N. Hixon of Iowa State College, presented a paper on thc United States starch industry, in which he discussed the use of agriculturally-produced starches to replace potentially exhaustible supplies of coal and petroleum. This was of particular interest to thosc from tropical countries poorly supplied with these mineral resources.

Other papers from this section that were of particular interest to the Conference were "Research on New and Extended Uses for Cotton" by Dr. F. J. Lynch, "The Development of New and Improved Uses for Surplus Crops" by H. T. Herrick, and "The Present Demand and Long-Term Outlook for Insecticides," by Dr. R. C. Roark, all of the Department of Agriculture; and "The Place of Fruit and Vegetable Preservation in the Emergency Situation and in the Future," by E. H. Wiegand of the Oregon Experiment Station. Resolutions were passed recommending the manufacture from farm products of alcohol for motor fuel and synthetic rubber and urging continued research on the uses of by-products and surpluses.

Irrigation and Farm Machinery

Most of the functions usually considered as included in agricultural engineering were treated in this Conference in other sections. Dr. Enrique Jorge Aguerrevere of Venezuela and C. S. Scofield of the United States prepared papers on irrigation in relation to the present and future productivity of the soil. "Influence of Farm Machinery on the Farmer's Standard of Living," by R. B. Gray of the Department of Agriculture, sparked discussion in several sections. Delegates agreed that the use of farm machinery raises questions of social adaptations required in order to make mechanization add to, rather than detract from, the spread of prosperity throughout the farming population. The resolution finally passed by the Conference recommended that stimulation of the use of farm machinery be accompanied by studies of its place in the national policies and social situations of the American countries. Increased emphasis on maintenance and efficient use of farm machinery now in operation was also stressed. Another resolution from this section foresees the extension of

irrigation works and the creation of national agencies for necessary study, planning and construction activities.

Throughout the Conference, the importance of inter-American collaboration in the war effort and in the future received first emphasis. General resolutions were passed recommending increased cooperation through the Pan American Union, the appointment of agricultural attachés to diplomatic missions, and further general use of such institutions as the United States Department of Agriculture, the Smithsonian Institution, and the various inter-American scientific societies.

The final resolution and certainly one of the most important is that requesting the establishment of a permanent committee to fulfill the recommendations of the Conference. Since the headquarters of this committee will be in Mexico City, Secretary Wickard has recommended that Lester D. Mallory, agricultural attaché of the United States Embassy there, be appointed as his alternate to serve on this committee.

The significance of the Conference was well summed up by President Manuel Avila Camacho of Mexico, in his address to the closing session, when he said:

"The conclusions reached by this Conference will not by themselves dispel the shadows that encompass us. Other things will be required: unceasing activity, firm decision and strict coordination between action of governments and the genuine will of their peoples. The Conference has, however, . . . honestly, courageously and clearly laid down general rules for our guidance. It has shown how the measures adopted in each republic should be linked with those taken by the other nations.

"The system of servitude which the dictatorships are attempting to impose upon the world cannot meet with a more energetic and resolute adversary than the free man of our fields. It follows that this assemblage has been particularly timely, inasmuch as it has served to strengthen on the scientific and economic planes those principles of conciliation, confidence and reciprocal encouragement that inspire our policies and brighten Pan American solidarity."

Official proceedings of the Second Inter-American Conference of Agriculture, containing full texts of papers and resolutions, will be published in English, Spanish, Portuguese and French. When ready for distribution, copies will be available through the Pan American Union in Washington.

Three Agreements Signed at Conference

Three inter-American agricultural agreements were signed by Secretary of Agriculture Wickard during the Second Inter-American Conference of Agriculture. One involves a new form of collaboration with Mexico in rubber production; the others are with Nicaragua, one providing for purchase of that country's surplus cotton and the other for cooperative establishment of an agricultural experiment station.

An agreement signed by Mr. Wickard and Secretary Gómez on July 14 calls for the establishment in Mexico as soon as practicable of five demonstration plantations of Hevea rubber, each tract containing not less than 300 hectares (about 750 acres) of land. A joint committee from the two governments is to select the lands; planting material is to be supplied from present cooperative rubber production stations in tropical America.

This action is regarded as a forward step in the Department of Agriculture program to develop plantation rubber production in Latin America. More than a million rubber seeds of Mexican origin and several thousand imported trees have already been planted at an experiment station established in 1941 at El Palmar, State of Veracruz, Mexico. Plantations called for by the agreement would serve as proving grounds for the trees and for plantation procedure and as further sources of improved trees for small farms and other commercial operations. The agreement is contingent upon the availability of funds for the purpose in both countries.

The two Nicaraguan agreements were signed by Mr. Wickard and Minister Zelaya of the Central American country July 15 at the U. S. Embassy in Mexico City.

The cotton accord calls for purchase by the Commodity Credit Corporation of the present Nicaraguan cotton surplus in an amount not to exceed 8,500 bales and of annual carryovers for the duration of the war, with a limitation of 3,000 bales a year on purchases after 1942.

As a condition of the agreement, Nicaragua will reduce its acreage of cotton in 1942 and succeeding years to not more than 3,000 manzanas (5,100 acres) and will encourage the diversion of cotton land to crops needed in the Western Hemisphere for food, feed and strategic purposes. Recent Nicaraguan cotton acreage has been reported in the neighborhood of 14,000 acres.

The second agreement with Nicaragua confirms a preliminary accord announced previously (*Agriculture in the Americas*, July 1942). It calls for cooperation between the two countries in the establishment of a tropical agricultural experiment station near Recreo, Nicaragua.

Argentine Chemists in USDA

Three agricultural chemists from Argentina arrived in the United States late in July for a year's study in the Department of Agriculture of the industrial utilization of farm products.

They are Carlos Clementino Zárate of the University of Santa Fé, whose special interest is the utilization of agricultural wastes; Oscar Saturnino Mallea, assistant professor of agricultural chemistry and microbiology at the University of Santa Fé, also a specialist on agricultural waste materials; and Dr. Enrique Duprat of the University of Buenos Aires, an expert on industrial fermentations who is particularly interested in the making of products from corn and wheat. A fourth scientist, José Baialardo, chemical engineer of the University of Santa Fé, was scheduled to join the group later.

Shown left to right in the picture above are Dr. Duprat, Mr. Zárate, Mr. Mallea and Dr. W. W. Skinner, acting chief of the Bureau of Agricultural Chemistry and Engineering, where the young scientists will work and study.

After a few weeks in Washington laboratories, the Argentinians will visit the Department's regional laboratories at Philadelphia, Peoria, New Orleans and San Francisco. Each man will then spend approximately six months in actual work at the laboratory in the type of research he selects.

The plan was arranged with the cooperation of the Department of State and the Office of Inter-American Affairs. It is of particular interest to Argentina because many of the products to be studied are important in that country and have figured in recurrent surplus problems there.

LATIN AMERICANS TO STUDY AGRICULTURAL ECONOMICS

Plans for a group of agricultural officials and students of Latin America to receive training in agricultural economics research in the Department of Agriculture and to study the administration of United States agricultural programs have been announced by the Bureau of Agricultural Economics.

Under the program, the visitors will receive "in-service" training. For the first few months they will study fact-gathering and research in economics and rural population and will learn about programs administered and conducted by the Department. When each has determined his field of special interest—whether in research or in administration—arrangements will be made for him to continue his study in a field office or in Washington.

Trainees are being selected on the basis of nominations submitted by the Latin American governments through the Department of State. The Office of Inter-American Affairs is also cooperating in the program.

A similar in-service training program is also being arranged by the Soil Conservation Service of the Department. The Rural Electrification Administration had such a program in 1941 and has expanded it this year.

Castilla Rubber's Comeback

A native American tree, once a contender for leadership among the world's sources of rubber, is coming back into prominence in the emergency, bringing new activity to the tropical American regions where there are numerous stands of planted and wild trees.

by H. F. LOOMIS

Fifty years ago the Central American rubber tree, Castilla, was one of the brightest prospects for plantation development among the world's rubber-bearing plants. It lost to more efficient rivals, but today the latchstring is out to Castilla again as a promising source of rubber needed in the present emergency.

During the last quarter of the nineteenth century, when rubber was becoming important as a commodity of commerce and the world was turning from wild sources to plantation production, several trees were rivals for prominence as yielders of rubber. In some countries the race went in favor of *Castilla elastica*, which had provided the natives of Mexico with rubber before Europeans first set foot in America. In other countries the favorite was the Pará rubber tree, *Hevea brasiliensis*, a native of the Amazon Valley. In Java both of these had fallen behind the Assam rubber tree, *Ficus elastica*.

Conditions that appeared best for a given species in one country were not suitable in another, and different species were chosen for cultivation. Plantation practices varied greatly and many methods of obtaining rubber from the trees were used.

In 1897 came a development that sent the Hevea tree far out in front of its rivals. Ridley reported from Singapore a new method of tapping Hevea trees without injury at intervals of one, two or three days throughout the season. The result was that annual yields exceeded those of the other species, which could be tapped only a few times a season without causing serious damage. Although the new system did not meet with instantaneous approval, its merits eventually were recognized and it made Hevea the preeminent plantation tree, since physiological differences and the structure of the bark prevented the same method from being used on the other rubber-producing species. Since then there has been no other plant to challenge Hevea as the most important source of rubber.

Long before Ridley made his tapping discovery public, Central America and Mexico had become interested in plantation rubber, and at the end of the nineteenth century popular opinion had crystallized in favor of Castilla in nearly all of these countries. This was quite natura

Photo by Collins, BPI.

Mexican specimen of Castilla rubber tree, with scars on trunk as result of first tapping.

for the tree was growing wild there, seed was abundant locally, and tappers familiar with the tree were in every native village. A few plantings of Hevea trees had been started in southern Mexico, but low yields, customary before Ridley's system was known, caused some of the plantings to be replaced by Castilla, from which much greater amounts of latex could be obtained at each tapping.

Mexico's interest in plantation rubber took tangible form in 1872 when 100,000 Castilla trees were planted in the State of Chiapas, although what might be termed small test plantings are known to have been made a few

years earlier. Not only did this large planting antedate any other known in the Western Hemisphere, but it was considerably earlier than the first commercial planting of Hevea in the East. By 1902, Mexico was reported as having over 10,000 acres of Castilla planted by organized stock companies with almost as much additional planting by private individuals. At the end of 1906, the total area in rubber had risen to over 80,000 acres and by 1910, the peak was attained with approximately 135,000 acres planted to rubber, much of it financed by foreign investors.

Castilla Production Declines

By this time, however, the price of rubber was dropping and production of Hevea rubber was increasing on the Eastern plantations with their much higher yields and somewhat lower labor costs. Expansion of American plantations ceased and many of those already in existence were abandoned. In 1921 less than six tons of tree rubber were exported from Mexico in contrast to more than 8,000 tons exported in 1910. Although the next few years saw some increase in production, it again dwindled and since 1928 less than a ton of that type of rubber has come from Mexico each year.

The same general trends were followed in other American countries, although Castilla rubber planting never reached the heights elsewhere that it attained in Mexico. Today, scattered throughout tropical America, are abandoned plantations which have been tapped at infrequent intervals to supply local "factories" with small quantities of rubber for making waterproof garments and other rubber or rubberized articles. While the huge profits dreamed of by the original owners never materialized, many of the old estates and the wild trees have continued to provide native families and small manufacturers with a means of support. Larger factories established in recent years have depended more and more upon imported Hevea rubber from the Far East, often at a cost higher than that for which it could have been produced in this hemisphere.

That is history. The present sees countless new adjustments to meet war conditions, and not the least of these is a greater reliance on rubber from wild sources, which once supplied the world's entire needs but in recent years has contributed less than 5 percent of the supply. Now that Hevea rubber from the Far East has been cut off, all possible sources are being scanned and the abandoned Castilla plantations and wild trees of the American tropics have come back into prominence. Conservative estimates place the amount of rubber that may be produced from Castilla trees in Latin America this year at 6,000 to 7,000 tons.

Rising prices will have some effect in inducing land owners and jungle residents to tap the planted and wild Castilla trees. In addition, rubber specialists of Latin America and the United States have been dispatched to producing areas to offer technical advice and other assistance wherever it may be needed to see that every pound of rubber comes to market.

Before the present war began, preparations had been made to utilize these rubber resources in an emergency. In 1923 survey parties of trained agricultural scientists went from the United States into all the tropical American countries to investigate their potential rubber-producing ability from wild trees, existing plantations, or areas that might be planted to rubber, as the first step in lessening dependence on the Far East for that essential raw material.

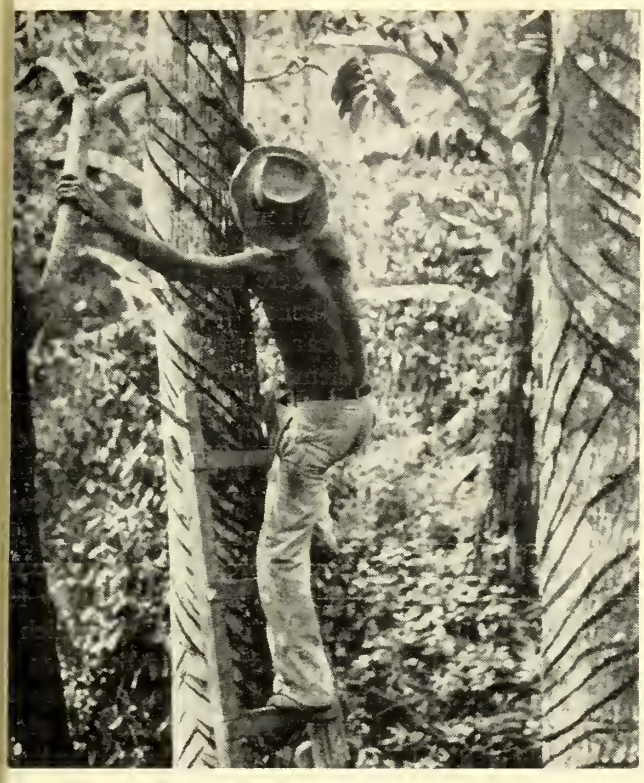
In 1940, under the impetus of a new world war and the threat of curtailed Eastern trade, field parties again went to these countries to cooperate with local scientists in bringing the earlier reports up to date and in laying the groundwork for developing American plantations of Hevea rubber. From survey reports, old and new, and from other sources has come information on the location of planted and wild Castilla trees, estimates of yields, labor supplies, shipping facilities, and other details. All of this is now being used in the effort to produce more rubber in the Americas.

The genus *Castilla*, often mistakenly called "*Castilloa*," belongs to the mulberry family, one of its tropical relatives being the breadfruit. When interest in Castilla plantations first arose, botanists had recognized only two species but laymen generally were in the habit of referring to all trees of the genus under the scientific name *Castilla elastica*, although this name could correctly apply only to trees originating in southern Mexico. The error persisted long after many more species were described, probably because *Castilla elastica* was the first member of the genus to be recognized and because the name was descriptive of the gum extracted from the bark. Now at least 10 species, extending from southern Mexico to Bolivia, Brazil and Peru, have been described on characters readily recognized only by botanists.

A Tropical Giant

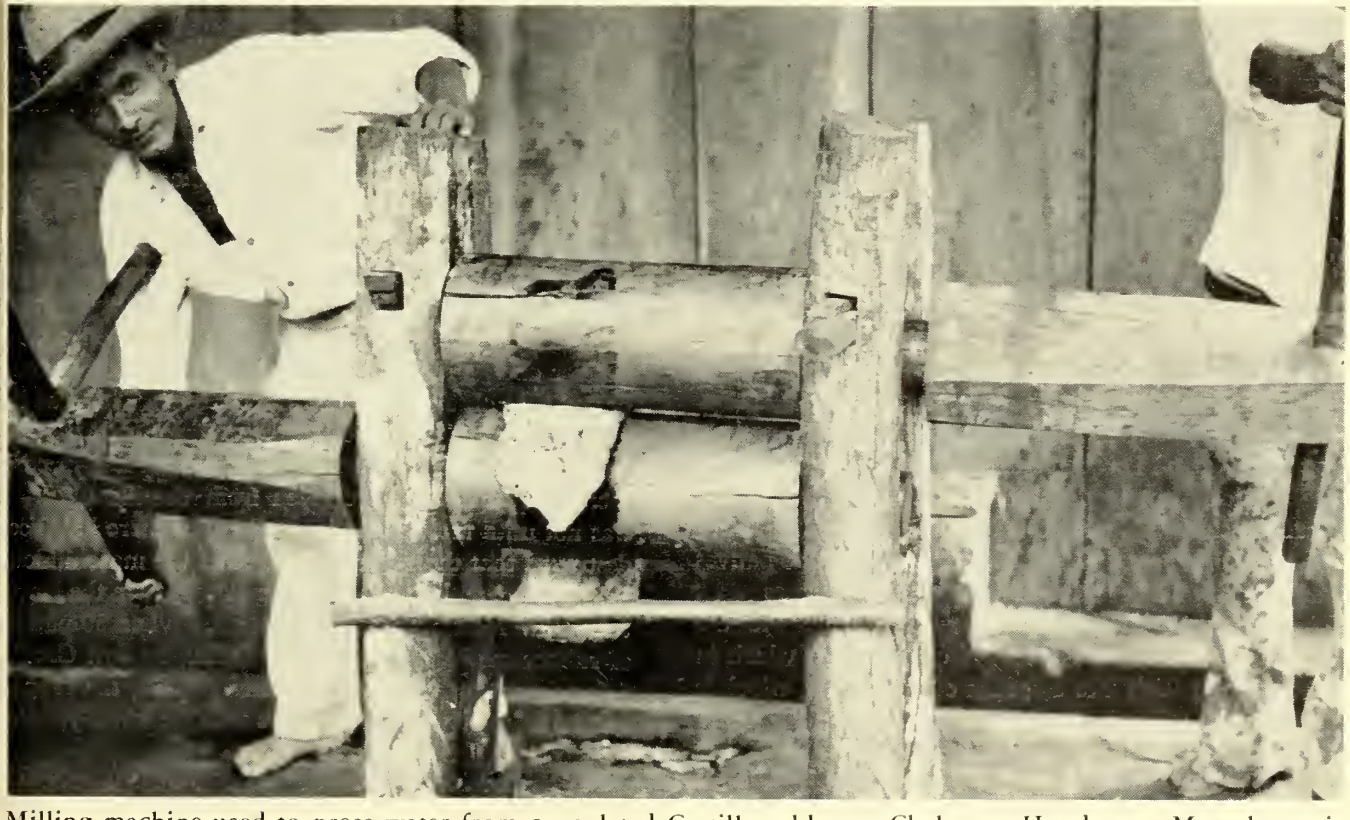
Although the Indians of every country where Castilla is native have their own name for it, the common name most frequently used in Central America and Mexico is *hule* and the men who tap the trees are called *huleros*. In South America *caucho* and *caucheros* are used instead and in the Panamanian region both pairs of names are heard.

Wild Castilla trees are at home in the open forests of the tropics or on the margins of dense jungles. The largest trees may grow to be 150 feet high and the trunks, with buttressed roots in old specimens, have rather smooth, thick, light gray-green bark. Trunks may be 5



Photos by Stadelman, BPI.

Two methods of tapping Castilla trees: (left) Honduran tapper using wooden ladder to reach upper portions; (right) Costa Rican workman is supported by shoe irons and rope.



Milling machine used to press water from coagulated Castilla rubber at Chaluteca, Honduras. Man shown is turning lower roller; just visible at right is workman turning upper roller.

feet in diameter but such giants now are rare. Large oval leaves, drooping from each side of long branches, give the tree a characteristic tropical appearance that once seen is never forgotten. In season, fleshy biscuit-like, orange or red fruits, their surfaces raised into conical elevations, are thickly distributed along the naked basal portions of most of the leaf-branches. In the Brazilian species *Castilla ulei*, the fresh fruits are said to be edible.

Not all the species yield rubber. In British Honduras and Costa Rica are two from the latex of which only a brittle resinous substance is derived. In other species rubber is contained in the latex, which may flow rapidly from tapping cuts in the bark or may issue more slowly or even fail to run, welling into thick masses which adhere to the cut surfaces. Some of these latex differences may be environmental or climatic, drought causing thickening of the latex and yields being reduced in trees growing at the higher elevations. This latter fact was not at first recognized and coffee planters in the highlands made the mistake of planting Castilla as shade for their coffee, thinking to secure satisfactory crops of rubber at the same time.

A Multitude of Tapping Methods

Methods of obtaining Castilla rubber have been even more diverse than those applied to most other rubber-producing plants. No entirely satisfactory way of harvesting Castilla latex ever has been devised, a condition that may be attributed to the fact that a half-dozen or more species of the tree were involved and differences of weather and altitude caused further complications. At the time when plantation enthusiasm was reaching its height and some standardization might have been expected to develop, tapping methods often varied with the locality. Adequate tests with tree crops usually require years for complete results to show and before these were obtained for the comparison of Castilla tapping methods, rubber production was rapidily shifting to the Orient and progress in Castilla ceased.

Among the early descriptions of native rubber gathering was that of Torquemada who, in 1723, stated that the Mexicans obtained latex "by beating the tree with a small hatchet. The liquid is then seen to ooze out from the incision made like blood from a wound. The natives gather it into dry hollow gourds of various sizes . . . Those who have no gourds besmear their bodies with the liquid substance as it flows out from the tree; which in drying forms itself into a species of membrane, which is easily taken off and whose thickness varies according to the coating spread over the skin."

Later the long bladed knife, known throughout the tropics as the machete, came into use for tapping the trees, especially when rubber was no longer looked upon as a natural curiosity but began to have commercial uses and to bring high prices. Long oblique gashes a foot or two apart were hacked in the bark from the base of the tree upwards into the larger limbs, often 30 feet above ground. The lower end of each gash joined a vertical channel down which the latex ran to a hollow in the ground, sometimes lined with leaves, where the latex was allowed to stand until coagulation took place and the rubber dried. Spiral channels also were used but not so often as the so-called "herring-bone" method. Sometimes the latex was caught in leaves and poured into receptacles or was run directly into them from the tree.

Such latex could be applied to garments or crude shoe-forms, one coat after another, until a water-proof article was produced. It could be made into rubber by spreading it in repeated layers on leaves, drying it in the sun, and then bringing the surfaces of two such leaves together and pressing on them to produce an intervening sheet of rubber from which the leaves were easily removed. The Indians also knew of vines from which a decoction could be made for addition to the latex to coagulate it and in many regions to the present day no better coagulant is known. The moonvine is most commonly used in this way. With trees where the latex was too thick to run, the rubber was allowed to dry on the cuts and later was stripped away.

Trees usually could be tapped two or three times a year without serious injury and with a fair yield each time, but more frequent tapping gave reduced flow of latex and the trees were likely to be killed. Inded, some trees were said to have such thin latex that a single tapping might bleed them to death. Naturally, plantation owners tried to maintain a system that would produce as much rubber as possible without endangering their trees too greatly. The huleros who tapped wild trees, however, were more interested in the initial amount of rubber they could get than in preserving the trees for future tappings. Trees could be chopped down, channels cut on the trunk and branches, even on the smaller ones, and the amount of latex collected far surpassed that obtained from standing trees. This was the method generally followed in the Amazon and it is believed that the first rubber to come from there in commercial quantities was derived from Castilla trees. It was not until most of the large Castillas there had been destroyed that the gatherers turned to the more difficult and less productive task of getting rubber from the Hevea trees scattered throughout the forests. When 50 pounds of rubber might be obtained by felling a giant Castilla 5 feet in diameter above the buttress roots, the tappers had no interest in slower methods or in the lower-yielding Hevea trees.

In the hands of an expert woodsman, a machete is deftly used as an all-purpose tool but no degree of dexterity could prevent its injuring the Castilla trees.

Photos by Allard, BPI.

Castilla latex is used in making rubber goods in Central America. Workman at Cartago, Costa Rica, spreads latex on cloth (left) as first step in production of raincoats (right), called *capas de hule.*

Many other types of knives, some specially invented, were tried in an attempt to find one that would assure the greatest yield without damaging the tree. Since the latex is carried in special tubes in the bark and is distinct from the sap, tools which penetrated through the bark and cambium layer to the wood were unnecessary. Apparently, the most successful knife was one resembling the Jebong knife used in tapping Hevea but much larger. This was drawn through the bark, leaving a broad rounded groove. The cutting edge was preceded by a gauge which could be adjusted to prevent penetration to the wood or cambium layer. Often the back of this knife was provided with a small sharp-pointed auxiliary blade used to cut down to the wood at the bottom of the channel, after the first flow of latex had lessened, as it was found that a renewed flow resulted. This blade has not been thoroughly tested but it is known to have caused injuries to trees that might outweigh its advantages.

The rubber obtained by these different procedures obviously was exceedingly variable in quality, the less carefully prepared kinds usually containing sticks, stones, earth and other debris from natural sources as well as a high percentage of moisture, and tappers were not averse to adding more adulterants when they thought their presence might escape the notice of the buyer. Along with the rubber in Castilla latex there is a considerable amount of resinous and albuminous matter that the primitive systems of production did not exclude. The presence of these impurities caused the rubber to darken as it dried, finally becoming almost black, and also caused it to deteriorate slowly and become sticky. Not until plantation production began was it discovered that Castilla latex could be washed, as the latex of no other tree can, by being repeatedly mixed with water which carried off the impurities while the rubber globules float to the surface as cream rises on milk.

In recognition of the inferior quality of much of this rubber, many attempts were made to improve the primitive coagulation methods. It was found that boiling fresh white latex did not have the desired result but if the latex were allowed to become dark-colored, which it soon did on exposure to the air, boiling caused prompt coagulation. If latex was diluted with five parts of boiling water, the addition of a small quantity of formaldehyde caused the rubber to rise and form a tough white cake on the surface in 24 hours. Attempts at coagulation by smoking the latex on paddles over a fire, as practiced by Brazilian Hevea tappers, indicated the great difference between the two types of latex. The Castilla latex was converted into an unsaleable black sticky gum by this process.

Now the best coagulation procedures begin with thoroughly washing the latex with hot water to remove as much of the resinous material as possible. After the

first dilution of the latex, it is sufficiently fluid to pass through progressively finer screens, the last of which may have as many as 60 mesh to the inch, for removal of the trash that invariably gets into the latex in spite of the utmost care. Several washings can be completed in a single day, after the last of which the creamy latex is ready for coagulation.

An acceptable coagulating method is to pour washed latex, in which a small quantity of formic acid has been throughly mixed, into a shallow pan where in a few hours a pad of white rubber is formed. This soft pad is removed from the pan and passed through well-tightened rollers of a sheeting mill of the type used in the preparation of Hevea rubber. Castilla coagulum differs from that of Hevea, however, and is passed through the rollers only once or twice, as repeated passage with the rollers progressively tightened does not press the rubber into a thinner sheet as with Hevea but causes unsightly milling marks that affect the marketability of the rubber. For this reason the coagulating pans are filled only sufficiently to produce a pad that can be rolled in one operation into a sheet thin enough to permit quick drying.

Castilla rubber is not yet being produced in sufficiently large standard quantities to have a fixed market price, but if it is clean and well prepared it should sell for nearly as much as high-grade Hevea rubber, since the quality is not greatly inferior. Castilla rubber prepared by any process is of value and can be used in the war effort but the poorer qualities naturally are less easily graded and full value for the rubber cannot be expected where impurities increase transportation and cleaning costs.

It does not seem that Castilla can be recommended for use in establishing plantations. Tapping methods and yield favor Hevea and it produces plantations that may be tapped in 5 or 6 years, while experience with Castilla indicates that trees under 10 years of age give extremely inferior yields and 20 years would probably be required in most cases before tapping would be justified. The value of Castilla today lies not in new plantations but in those established many years ago, as well as in the wild trees from which production is being stimulated to the utmost.

Not only are the American republics attempting to encourage the immediate production of large quantities of Castilla rubber but scientists are initiating studies which may lead to increased production in later years. Improvements in tapping, collecting and coagulating the latex and in preparation of the rubber are being sought. In addition, the possibility of making plantings for harvest and of extracting latex mechanically from seedlings at the age of 1 or 2 years is being investigated. Determining the proper time for tapping and its frequency also may result in higher yields that will contribute to the production of greater amounts of Castilla rubber this year and in the future.

Reading
ABOUT THE AMERICAS

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ALONG THE *Agricultural Front*

▲Chile Increases Its Production of Hemp

The largest hemp crop in the history of Chile was harvested in that country this year. Production amounted to 14,404 long tons of fiber, 74 percent more than the 1940–41 crop, and 29,500,000 pounds of seed, more than three times the crop of the previous year.

Chile has been encouraging its farmers to increase their hemp acreage in recent years, since Italy and Yugoslavia were formerly the principal suppliers of the fiber. Further increases are seen as likely in view of the probable substitution of some hemp for abacá, formerly obtained from the Philippine Islands.

Before the war, the United States ordinarily took only about 1 percent of Chile's hemp exports, but its place in the trade has increased considerably. In addition to supplying the United States with hemp fiber, Chile has made several shipments of seed to this country for use in the Department of Agriculture's domestic hemp production program.

▲Argentina Storing Corn Underground

The Argentine Ministry of Agriculture has announced the successful completion of an experiment to store corn in underground silos. A year ago 16 such silos were constructed in Córdoba, and the shelled corn stored in them was found to be in excellent condition when inspected recently. This type of storage is regarded as desirable because it would release wire and other essential materials ordinarily used in the building of maize stacks.

▲U. S. and Uruguay Sign Trade Agreement

Fourteenth trade agreement to be concluded between the United States and a Latin American republic is that with Uruguay, signed at Montevideo July 21 by Alberto Guani, Uruguayan Minister of Foreign Affairs, and William Dawson, U. S. Ambassador to Uruguay.

Designed to integrate the economies of the two nations during the present emergency and to provide a basis for post-war trade relations, the accord contains trade concessions on articles which normally account for about a fourth of U. S. exports to Uruguay and about a third of Uruguayan exports to this country.

Under the agreement Uruguay grants 30 percent duty reductions on imports from the United States of walnuts, pecans, dried prunes, and raisins and a 64 percent reduction on fresh apples for the season from September to February. Other agricultural products on which Uruguay makes duty reductions include canned asparagus, fruit and vegetable juices, concentrated grape juice, and cigarets. Existing Uruguayan duties are bound on imports of hops, malted milk, flue-cured, fire-cured and burley tobacco, and spun cotton. In addition, concessions are made on several U. S. industrial products.

Concessions to Uruguay are made on a substantial number of agricultural commodities, including casein, beef and mutton tallow, oleo oil and stearin, meat extract, certain canned and preserved meats (mainly canned corned beef), pickled or cured beef and veal, flaxseed, certain carpet and coarse apparel wools, cattle hides and skins, dried blood, bones and a few miscellaneous meat by-products. Rates of duty provided for all these products are the same as those embodied in the U. S.-Argentine trade agreement, which became effective last Nov. 15.

▲Textile Bag Factory Planned for Cuba

Plans for the establishment of a textile bag factory in Cuba have been announced by the Ministry of Agriculture of that country. Simultaneously, it was announced, research work at several Cuban experimental farms is being undertaken on a large scale to secure new fibers from textile plants grown in the republic.

The necessity for Cuban production of fiber bags, particularly for use in the sugar industry, is regarded as urgent in view of the scarcity of bags manufactured from jute and other materials formerly imported from the Far East.

▲Chilean Mission Signs Trade Accords

Efforts of a Chilean Trade Mission on a tour of various Latin American countries this year resulted in the signing of a *modus vivendi* pact with Mexico and the amplification of existing agreements with Colombia, Cuba, Ecuador, Peru and Venezuela.

▲Brazil Sees Record Castor Bean Crop

Brazil anticipates a record castor bean crop this year, with probable production estimated at 220,000 tons, 20,000 tons more than the 1941 crop, the largest ever reported. Most of the beans are produced for export, since Brazil uses only small amounts of castor oil in its industries.

Production of castor beans in Brazil is extremely sensitive to market conditions, since there are wild stands in every State that are harvested extensively only in years when

demand is strong and prices are good. The United States, needing large quantities of castor oil for use in war industries, is now Brazil's chief customer for the product, most of which was shipped to Europe before the war.

▲Oil Palm Production Stimulated in Ecuador

Production in Ecuador of the nuts of a palm known locally as "palma real" has been greatly stimulated since the outbreak of the war, according to word received from that country. The tree grows wild in the forests of Ecuador, and the nuts yield an oleomargarine-like oil used locally for the manufacture of soap.

About 1,500 tons of the nuts were gathered in 1941, and a doubled production is anticipated this year. Chile was at one time the only foreign buyer, but sales are reported to have been made recently to Panama and the United States. Ecuador has imposed regulations to assure that the needs of local factories are satisfied before the surplus is shipped abroad.

Agricultural authorities state that the tree is not the royal palm as generally recognized but probably the *cocos butyracea* Linn., known in some areas as the "wine-palm."

▲New Tire Factory Planned in Peru

Plans for a tire factory to be established in Peru as a branch of a United States firm have been announced. Scheduled for completion within a year, it is expected to use rubber and cotton produced within Peru.

▲Peruvian Farm Youth Trained in Clubs

To train the agricultural technicians of the future, the Agricultural Station of the Department of Junín, Peru, is encouraging the organization of groups known as Agricultural School Clubs. Operated in connection with rural schools, they are made up of farmers' sons between the ages of 6 and 15 years and are patterned after the 4–H Clubs of the United States. Members are trained in technical farming methods and the use of modern machinery.

▲Argentine-Brazilian Bridge Is Planned

Bids have been opened for the construction of a bridge over the Uruguay River that is viewed as an important commercial link between Argentina and Brazil. The two countries will share the cost of the structure. The new bridge will cross the river from Paso de Dos Libres, on the Argentine side, to Uruguayana, Brazil, some 40 miles above the point where Argentina, Brazil and Uruguay meet.

▲Brazil and Paraguay in Economic Agreement

An agreement has been reached between Brazil and Paraguay under the terms of which the latter country is granted a loan of 100,000 contos, the proceeds of which will be used to help Paraguay carry out a six-year plan of economic development. The program includes aid to agriculture and industry, reorganization of the Bank of Paraguay, construction of highways, military works, schools and hospitals.

▲Agricultural School Planned in Honduras

Plans for the establishment of an agricultural school on a 3,000-acre tract in the Zamorano Valley near Tegucigalpa, Honduras, have been announced by the United Fruit Company. Named the Escuela de Pan America, the school will accommodate 40 students a year, who are to be selected from various Central American countries.

The school will have sections on agriculture and forestry, livestock and dairying, agricultural engineering and horticulture and will offer some instruction in mathemetics, general science, physics, chemistry, biology, English and Spanish. Students will spend half of each day in classwork and a half day in the field.

Establishment of the school is related to the Company's recent announcement that it has adopted the policy of aiding Central American countries to expand their production of tropical crops needed by the United States and formerly imported from the Far East.

AUTHORS in this Issue

Ralph H. Allee ("Agricultural America Mobilizes") is Chief of the Division of Latin American Agriculture, Office of Foreign Agricultural Relations. He was a technical adviser to the United States delegation at the Conference he describes. *H. F. Loomis* ("Castilla Rubber's Comeback") is a member of the staff of Rubber Plant Investigations, Bureau of Plant Industry.

AGRICULTURE IN THE AMERICAS ROBERT H. INGRAM, EDITOR

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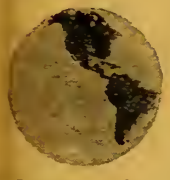
Adrián Recinos

OUR MUTUAL FRIEND



In 1524, Pedro de Alvarado, a lieutenant of the redoubtable Cortez, swept south from Mexico and established the Spanish colony of Guatemala, embracing all the territory now known as Central America. Three eventful centuries later there emerged from the short-lived Central American Federation, the present country of Guatemala—rugged, colorful and less touched by European influence than perhaps any other republic in the Americas.

From Guatemala in January 1928 came Dr. Adrián Recinos to present letters of credence as Envoy Extraordinary and Minister Plenipotentiary to the government of the United States. Today, 14 years later, Dr. Recinos is one of the highly respected veteran diplomats in Washington.

From the university in Guatemala City, where he received the degree of bachelor of science and letters and that of lawyer and notary, Dr. Recinos immediately entered into his public career. His first assignment, secretary of the Legation of Guatemala in El Salvador, was followed by an appointment as first officer of the Ministry of Foreign Relations, then as Under secretary of Foreign Affairs.

In 1923 Dr. Recinos was appointed Minister Plenipotentiary to France, Spain and Italy. During his stay abroad he sat with the Assembly of the League of Nations, received such European honors as the Grand Officer de la Legion d'Honneur of France, and Officer of the Crown of Italy, and was chosen for membership in the Institute of Comparative Law of Brussels and the Ibero-American Institute of Comparative Law of Madrid.

He resigned his European post in 1925 and a year later was elected President of the Guatemalan Congress, where he devoted himself energetically to the progress of agriculture.

The Guatemalan Minister is also a prominent journalist, the author of a text entitled "Lessons in Philosophy," and has given much assistance to archeological expeditions studying the ruins of the Mayan civilization in Guatemala.

Ability and experience have established Dr. Recinos in Pan American circles as one of the outstanding Latin American leaders in the diplomatic corps.

Conference Sidelights

{Continued from page 162}

sold in the markets of Mexico City and the restricted diets of farm people in the arid and semi-arid regions visited by delegates. Irrigation projects that have been undertaken in the latter areas, she reports, can do much to make available foods urgently needed for improved health. Dr. Steibling was also interested in the fact that the Institute of Public Health is undertaking Mexico City's first scientific study of diets in relation to health. She believes the United States can learn from the experience of many Latin American countries in the operation of so-called popular restaurants, where families receiving public aid may obtain wholesome meals in an attractive environment.

The official Conference symbol, printed on programs and other literature, depicted a plow superimposed on an ear of corn. . . . The Mexican Government issued a special set of stamps in honor of the Conference in denominations from two cents to one peso, illustrated with engravings on agricultural subjects. . . . A special concert for the delegates was given by the Orquesta Sinfónica de México, the national symphony orchestra. Some delegates saw inter-American and agricultural touches in the playing of Dvorak's New World Symphony and Beethoven's Pastoral Symphony.

Not directly a part of the Conference but contributing to its success were special trips to Mexican regions of historic and agricultural interest. Several important irrigation projects of the Mexican government were visited, and a trip to the Zacatepéc sugar mill gave some of the North American delegates their introduction to tropical agriculture at first hand. An excursion to the pyramids of the pre-Incan Toltecs at Teotihuacán was of particular interest to those delegates who regard a knowledge of ancient civilizations as a fundamental to the formulation of American agricultural policy today.

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IN THIS ISSUE

October 1942

Agriculture's CCC

Under a directive issued by the Board of Economic Warfare in May 1942 the Commodity Credit Corporation, an agency in the United States Department of Agriculture, was designated the exclusive agency for the negotiation and conclusion of all imported materials contracts for most agricultural commodities.

In the Commodity Credit Corporation this work is under the direction of H. B. Boyd, Everett Cook, and Miguel K. Crossnay, the latter two drafted from industry to head one of the most active and expanding buying units in the Government. Since its creation at the end of May, approximately 225,000 tons of materials have been contracted for. This is the beginning of a program which promises to expedite the war and shape the peace. Included in BEW's directive are commodities ranging from alcohol to wool grease, with Bois de Rose, pyrethrum flowers, and whale oil included in between.

Despite the shipping crisis, commercial contracts, impossible in private enterprise, have been consummated. Moreover, the economy of Latin America is being stabilized, and our own economy strengthened by the purchase of needed materials at reasonable prices.

Thus a threefold function is achieved by the Corporation's Foreign Purchase Division: We who need to buy because of a shortage of certain war commodities are purchasing from Governments and individuals who have these commodities to sell—and we are buying at prices which do not strain the war purse.

With Brazil, the twenty-ninth country to join the United Nations against the Axis, the Commodity Credit Corporation has contracted agreements to purchase babassú kernels and oil, castor beans and oil, and rotenone. The structure of all of these contracts is the same: Brazil agrees it will use its best efforts to cause the maximum quantity to be produced and exported to the United States; Commodity Credit agrees that it will use its best efforts to expedite the purchase and exportation of the products it intends to buy under these agreements.

In the case of babassú, there has been written into the agreement that if, during the first or second year, more than 35,000 metric tons of babassú kernels or oil or oil equivalents are purchased, additional amounts will be paid to the Government of Brazil. These sums shall be devoted solely to the development of facilities encouraging fats and oil enterprises in Brazil, including roads and transportation facilities, docks and warehouses.

Commodity Credit contracts for the purchase of castor seeds and alcohol have recently been signed with Mexican sellers. The contract for alcohol provides for the purchase of the entire exportable surplus of the production of alcohol from Mexican molasses or sugarcane juice for the year ending December 31, 1942.

Cotton agreements (see p. 183) have been reached with Peru, Nicaragua, and Haiti. In addition to cotton, Peru will also sell her scutched flax to the Commodity Credit Corporation.

More than ever, the United Nations need fats and oils, fibers, and alcohol. The Board of Economic Warfare's directive to the Commodity Credit Corporation is the answer.

Rio has kept its promise. The program of the Commodity Credit Corporation in the Department of Agriculture is the response to Resolution II of the Rio de Janeiro Conference of Foreign Ministers calling for the mobilization of the economic resources of the hemisphere and the maintenance of the economies of the American Republics.

Agriculture IN THE *Americas*

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Cotton Becomes a Hemisphere Problem

The most important fiber in the world is cotton. But it is the "white gold" that is too plentiful. Cotton farmers of the Western Hemisphere, encouraged by recent Commodity Credit Corporation purchase agreements, are helping each other solve the problems of surplus and improvement.

by P. K. NORRIS

The announcement that the Commodity Credit Corporation of the Department of Agriculture has completed agreements to purchase cotton from Peru, Nicaragua, and Haiti is indicative of a new approach to one of the oldest and most troublesome of agricultural problems, the glutted cotton market of the world.

These agreements involve more than the obligation to purchase surplus cotton. They go beyond the expediency of a subsidy and probe the heart of the problem. Cotton farmers of the Americas will focus on cotton of better grade, staple length, and character—qualities required for the production of fabrics which will meet Army specifications and for lend-lease purposes.

Further, the Memorandum of Understanding provides for diverting areas formerly devoted to cotton to the production of food and feed crops and other strategic raw materials.

While local in scope, the agreements form a nucleus around which an international agreement might develop. They give recognition to the fact that economic strength cannot be an isolated phenomenon but must be shared by all the countries of the western world for effective collaboration and exchange of advanced agricultural technique, and for a real expression of the Good Neighbor policy.

The farmers of the Western Hemisphere produce about 15,000,000 bales of cotton a year, a little more than half of the world's annual crop. Of this, approximately four-fifths is grown in the United States and the remainder in Latin America. Brazil, Mexico, Peru, and Argentina are the most important Latin American producers, followed by Paraguay, Colombia, Haiti, Nicaragua, El Salvador, and several others of lesser importance.

The United States has not always overshadowed Latin America in cotton production as it does today. The early settlers along the coast of what is now Brazil developed large cotton plantations long before the farmers of North America adopted the crop. With the invention of the cotton gin, however, the crop became more and more important in the United States, which by the middle of the nineteenth century was producing the greater part of the New World cotton supply.

Picking cotton in São Paulo, South Brazil. Cotton in this area is of American Upland varieties.

During the Civil War several South and Central American countries began to expand cotton production, but after the war they were unable to compete with the United States and drifted into other types of agricultural production. Coffee became the chief crop of Brazil, and sugar gained in importance in Peru. With the rise of

The author, P. K. Norris, visits a cotton gin in Peru. Eighty-five percent of Peruvian cotton is Tanguis, noted for its long staple, harshness, and whiteness. Peru also grows Pima, similar to the long-staple cotton of New Mexico and Arizona.

the rubber industry in the Amazon Valley, cotton declined still further, and South America was almost eclipsed as an important cotton-growing area. In recent years Latin America has again come to the fore, with several countries producing cotton in excess of their domestic requirements.

Brazil is the leading Latin American cotton producer and probably has the greatest potentialities for development. Its cotton belt is divided into two distinct districts, northeastern Brazil and the southern States of São Paulo, Minas Geraes, Paraná, and Rio de Janeiro. The more important of the two is the southern belt, where expansion has been extremely rapid in the last 10 years. Cotton in this area is of American Upland varieties like those grown in the southern United States. Its staple length is comparable to that of most of the cotton grown in the United States, Mexico, and Argentina, and it is produced under conditions that make it competitive in world markets with the product of those countries. The producing area of northeastern Brazil supplies a large part of the domestic spinning industry, thus leaving a good part of the southern crop for export.

The principal cotton-growing area of southern Brazil, in the State of São Paulo, is similar in rainfall, soil, topography, and other natural factors to much of the Piedmont area of the southeastern United States. Because the São Paulo farmer lives south of the equator, he plants his crop about the time the North American farmer is harvesting and is ready for harvest about the time cotton-planting is in progress throughout the United States cotton belt.

For a number of reasons São Paulo cotton has found a ready market in Europe and the Orient. For one thing, it is practically all of one variety and is so uniform in staple length that it is not necessary to staple each bale. Many handlers of São Paulo cotton only staple one bale out of 8 or 10. This uniformity has impressed European and Oriental cotton merchants. Further, the São Paulo crop is ginned on comparatively new gins under the supervision of Government agents whose duty it is to see that they are operated with as little damage to the lint as possible. Cotton is classed by the Government as a public service.

The soil and climatic conditions, as well as the regulations regarding the cotton-growing industry in southern Brazil, are topics of discussion for farmers in other parts of the Americas, especially in the United States. There are many who believe that a few of the practices followed by Brazilian farmers in the production and marketing of cotton would be an improvement over some of the practices now common in the United States.

To the south and west of the southern Brazilian cotton belt lies a plain known as El Chaco, the chief cotton-growing region of Argentina. From the standpoint of soil and climate El Chaco might be compared to Texas. Along the eastern side the rainfall is ample, but farther west, as the elevation increases, the rainfall decreases. The western portion of El Chaco is similar to the high plains area of Texas, except that winter temperatures are never as low.

The expanding spinning industry in Argentina is absorbing a considerable volume of cotton. In addition, Argentine cotton has been favorably received in several European cotton-spinning centers. The volume of exports is credited to the remarkable uniformity in character and staple, valuable assets in spinning. It is all of Upland varieties and can be used for practically the same purposes for which southern Brazilian, Mexican, or North American cotton is used.

Most of the west coast of Peru is desert. The only cultivated areas are a number of valleys and deltas built up by rivers fed by rains and melted snow of the Andes. Since there is practically no rain along the coast, the agriculture of this area depends on irrigation. The cotton grown in these irrigated valleys makes Peru one of the important cotton-growing countries of Latin America.

Peruvian cotton is of different character and staple from the cotton of Brazil, Argentina, Mexico, and the United States. Approximately 85 percent of the Peruvian crop is the famous Tanguis variety, characterized by its long staple, harshness, and extra whiteness. Tanguis cotton has been used a number of years for the special purpose of mixing with wool. The most important purchaser of Peruvian cotton has been the United Kingdom. American spinners have preferred the finer, more silky, and softer cotton of Egypt. A small part of the Peruvian crop is of the Pima variety, similar to the long-staple cotton grown in New Mexico and Arizona. The growers of long-staple cotton in the United States are particularly interested in the cotton produced in Peru, since it may be adapted to uses that will bring it into closer competition with the staples of the United States.

Mexican cotton is like that grown in the United States. It is ginned and handled the same way, so that by the time it is sold for export it may lose its identity and enter the world market as United States cotton. The chief difference is that Mexican cotton is grown in areas which require irrigation. Prominent among the irrigated cotton centers of Mexico are the Torreón district, the Matamoros region, and Mexicali in Baja California. The soil, climate, and irrigation conditions of Mexican cotton-growing areas are similar to those of California, New Mexico, and Arizona.

While the cotton growers of the Americas are competitors they are also in a sense partners. On several occasions they have indicated that they endorse united action as a solution of the world cotton problem. At the invitation of the United States, representatives of several Latin American countries attended the International Cotton Meeting in Washington early in September 1939. Unfortunately, the war in Europe broke out just as this meeting opened, and many of the delegates felt that because of the changed conditions, no action should be attempted at that time. However, the delegates did authorize the formation of an advisory committee for the purpose of keeping the governments of the various cotton-growing countries informed of the world cotton situation. Representing the Western Hemisphere on the International Cotton Advisory Committee are delegates from the United States, Mexico, Peru, and Brazil.

A cotton subcommittee of the Inter-American Financial and Economic Advisory Committee has also given considerable attention to the cotton problem of the Americas. This committee has held a number of meetings in Washington, and its members have indicated the willingness of their governments to cooperate in an international effort to solve the cotton problem. A number of the smaller as well as the more important cotton-growing countries of Latin America are represented.

The cotton farmers of the United States are alive to the cotton-producing potentialities of Latin America. The Piedmont farmers of the southeastern States see conditions in São Paulo similar to their own; Mississippi Delta cotton growers see their soil and cotton duplicated in the coastal plain of Peru: El Chaco is a replica of the cotton picture of our western plains; and Mexican cotton cannot be distinguished from the United States varieties. It follows that blind competition must yield to cooperation, encouraged by such agreements as those recently concluded by the Commodity Credit Corporation with Peru, Haiti, and Nicaragua.

A cotton gin in Argentina where cotton is like that of Mexico, South Brazil, and North America.

Photos by P. K. Norris

Cotton arriving at the gin. São Paulo is the chief cotton-growing region of South Brazil.

Erosion in the Americas

All we know for sure—the land's going out from us:
Blown out by the dry wind in the wheat:
Blown clean to the arrow-heads under the centuries:
Blown to the stony clay . . . (Archibald Macleish)

by H. H. BENNETT

Good agricultural land is the most important of man's material possessions. In time of war, it is as important as guns and ammunition. Today, the United Nations look to the farm fields of the American continent to produce the food and fiber that will win the war for liberty and civilization. The Americas—North, Middle, and South—can do this and can continue feeding the world for years to come—if the land is used wisely.

Conservation work for the control of soil erosion has, of course, been practiced in the Americas almost since the beginning of agriculture. In the Andes of South America, the Incas established a stable bench agriculture, much of it provided with irrigation, that represents one of the best pieces of engineering work ever accomplished by man. On some of the steeper slopes, rock-walled terraces perhaps 600 or 700 years old, possibly 2,000 years old, are still holding, and some of them are still used for crop production. The cost of these structures has been estimated at $18,000 an acre, computed on the basis of modern conditions in the United States.

Much American soil, however, has been used carelessly for centuries. There has been no willful waste, but it has been traditional to believe that productive soil was superabundant in the Western Hemisphere. It is only in comparatively recent years that soil conservation has been appreciated as a means both of preserving cropland and grazing land and of obtaining better production from those lands.

Of immediate importance is the fact that many soil conservation practices can help in increasing production of oil-bearing crops, corn, butter, cheese, and other farm commodities needed to meet war demands. Soil conservation is not entirely a matter of physical works, such as contour farming and terracing, that require preparation and time. There are many simple practices that increase yields by maintaining the fertility of the land. All cropland—level as well as sloping—must be maintained in this way if it is to continue producing big yields.

Local yields of corn, for example, can be increased by growing the crop on land that is level or practically level and by using such simple conservation practices as liming, fertilizing, and manuring. Conservation farming methods will bring increased yields of potatoes and cotton and fruits. Such a simple practice as mulching with some form of vegetation litter has resulted in marked crop increases in many instances.

By careful management of grazing lands, the production of beef has been stepped up. Milk production has been increased simply by rotating dairy herds on pasture land. Some farmers have increased their pork production inexpensively by fattening hogs partly on legume pasture instead of entirely on corn. And the legumes improve land where corn tends to exhaust it.

One of the great needs of the war is for large increases in vegetable oils and fats. Soybeans constitute one of the temperate zone's most important sources of vegetable oils. Farmers usually have grown soybeans in rows drilled far apart and cultivated like corn. Once it was thought that they had to be grown that way and that the erosion frequently resulting was inevitable. Now, through research and experience, it has been proved that by drilling the soybeans close together on the contour, erosion has been practically stopped and better yields obtained at the same time. It is another case where soil conservation measures have increased crop yields while protecting the land.

Meeting Wartime Goals

All this is good news for the United Nations. It is of extreme importance because it is the only way the farmers of the United States can meet their heavy wartime farm-production goals. It cannot be done by the outmoded farming methods of yesterday. And even if it could, it would be only at the grave risk of damaging more valuable land, some of it beyond the possibility of practical restoration.

Beyond its emergency importance, soil conservation may be regarded as essential to the preservation of our civilization. Surveys made throughout the world reveal instance after instance of civilizations that have been effaced from the earth because of soil erosion. In a survey of ancient African and Asiatic areas completed just before the beginning of the present war, Dr. W. C. Lowdermilk of the Soil Conservation Service found great

areas of land ruined by erosion—areas that formerly supported dense populations. In places the land was not only stripped of its topsoil and horribly gullied, but the subsoil had washed off to bedrock. Great civilizations have disappeared, and the remnants of their peoples are still to be seen wandering in search of water and grass for their flocks.

Those ancient peoples used their land for thousands of years, but in some parts of the Americas enough good land to support whole nations has been used up within a single century. In various parts of the Western Hemisphere the rate of erosion has been astoundingly rapid because of the torrential rainfall, high susceptibility of the soils to washing or blowing, and lack of information on and interest in the subject. In too many localities the unnecessary devastation is still going on.

The period of the 1930's may well go down in United States history as the decade of soil conservation. Today, interest in the subject is spreading throughout the other American republics. The United States Department of Agriculture, at the invitation of some of the other American republics, has sent missions into some of those countries to study the erosion problem and other agricultural matters. Toward the end of 1941 I went with other Department representatives into Venezuela for such a study. I have also traveled and viewed soil conditions in several of the other South and Central American republics.

Erosion is particularly bad in the northern and eastern parts of Venezuela, especially in the mountain sections, where there is severe sheet washing and gullying. The Venezuelan Government is making an intensive study of the problem and taking steps toward its solution. In Colombia—where there is also a big erosion problem—provision has been made for the establishment of "protected forest zones" where lumbering operations may be carried on only under government supervision. Colombia also is establishing state nurseries to aid in the reforestation of denuded areas.

There is severe erosion in parts of Brazil, also. In the central part of the State of Minas Geraes the problem has become serious since agricultural expansion has caused the clearing of much forest land, and reforestation has not been carried out adequately. However, demonstration and experimental work on erosion control seem to be getting under way. Slight to severe erosion has affected about half the farming land in the State of São Paulo, where the mechanization of agriculture has advanced farther than in most other regions.

Chile, too, has its erosion problem, and its frequent accompaniments of drought and flood. There are few forests in the northern Chile valleys, and this situation results in tremendous floods and the loss of a great deal of topsoil. Often this topsoil, washed down from upland farms, is carried into reservoirs, some of which have been

Severe erosion of a wheat field near the Mucuchíes Experiment Station in Venezuela.

ruined by sedimentation. An example is the reservoir above Pangal Dam, in Cochapoal. This was completely filled with silt in about nine months. Other sections of Chile suffer from erosion, too. The government already has taken steps to alleviate the situation. The control measures include tree planting on marginal farm lands; changes in agricultural methods, particularly in the arid areas; and encouragement of cattle raising in the humid zones. Soil building and tree planting are somewhat difficult in the drier areas where droughts are frequent during summer.

Argentina has some serious erosion. Wind erosion is a difficult problem in the semiarid middle west—the eastern section of La Pampa, southeast of Córdoba, and west of Buenos Aires. Serious erosion by water is seen in areas of abundant rainfall where there has been too-intensive cultivation and grazing of steep slopes. And here again the government is tackling the problem in businesslike fasion by establishing a soil conservation program.

In Peru, while there is considerable severe erosion locally, the situation is somewhat different. Hardly enough rain occurs in some parts of the country to cause serious erosion, and there is comparatively little forest land to be preserved. In some of the more thickly settled portions of the low-rainfall regions conservation becomes largely a matter of saving water for irrigation along the streams, such as those traversing the western desert areas. Water for irrigation is obtained frequently by pumping it from depths of 50 to 500 feet under the surface of the principal river valleys. Peru also is experimenting with diversion of flood waters from the rivers to irrigate suitable adjacent lands. If these trials prove satisfactory, it has been predicted that farm production on irrigated lands may be increased by a third and that portions of present desert areas may become croplands.

Eroded area near Tlaxcala, Mexico. Both the soil and the subsoil have been washed off to bedrock, leaving the land permanently ruined. No effort was made to stop the erosion.

Soil Conservation Service

Another section near Tlaxcala, Mexico, where erosion has been controlled with rock-wall terraces. Erosion is a serious problem in Mexico, especially on the steeper slopes that have been cultivated a long time.

Specialists of the United States Department of Agriculture who recently made a study of agricultural conditions in Ecuador have this to say about erosion conditions in that country: "Intensive cultivation, particularly on the very steep mountain slopes, has contributed to much soil wastage from erosion. This erosion is due to wind as well as water, but with the exception of a few of the arid regions where the soil is very light, water erosion is the most severe. Run-off from rain and poorly controlled irrigation water has caused severe damage and fields may often be seen where the top layer of dark humus-laden soil has been entirely removed, and the land has had to be abandoned . . . In areas where there is only a thin layer of organic soil covering loose sandy material, and where dry farming methods are practiced, wind erosion causes severe damage on exposed areas.

"Examples of almost total destruction of land by water erosion were seen near San Gabriel in Carchi Province, at Ambato in Tungurahua Province, and at Guamote in Chimborazo Province. This wastage of land naturally throws an additional burden on that yet remaining, and one of the greatest problems facing Ecuador in the future is that involved in finding adequate land resources to support the population."

It has been estimated that in the inter-Andean section of Ecuador, approximately 75 percent of the land originally in cultivation between Loja and Cuenca, along an air-line distance of about 150 kilometers, has been abandoned because of erosion. Only about three percent is now in cultivation. Here many of the slopes are very steep, and they have been cultivated for serveral centuries.

Soil-Building Practices

In Mexico erosion is a serious problem in numerous localities, particularly on the steeper slopes that have been under cultivation for some generations. In various localities overgrazing has started some severe washing. One of the most violently eroded sections is in the hill country surrounding Lake Patzcuaro in the State of Michoacán. In some parts of Mexico, farmers have long practiced the building of stone fences across slopes approximately on the level, apparently to catch soil moving downhill under the impact of uncontrolled run-off from rains. After a time this practice has brought about the development of bench terraces of a decidedly stable nature—pretty nearly secure against erosion. Something of the same kind has been accomplished in some fields with contour plantings of maguey. There are areas in northern Mexico where grazing has not been severe. Some of these localities have the best natural grazing lands to be seen anywhere under low rainfall conditions.

The problem of erosion is reported as serious in some parts of Uruguay. In the West Indies, much land has been severely impoverished—in Puerto Rico and Haiti, particularly. Certain parts of Cuba have suffered, but in that country considerable land is highly resistant to erosion because of the nearly level surface and the high capacity of the soil for absorption of rainfall.

Some of the land of the Americas has been damaged, but there remains a tremendous reservoir of productive soil that will last many centuries if it is properly used. In order to do that, the American republics must know what their land is capable of producing—what sort of crops it is best suited to grow and what sort of care it must be given. They must know the land intimately before they can work out a safe and efficient program of cultivation. This means that the land must be studied carefully through physical as well as economic surveys.

Mapping For Land-Use Capabilities

In order to ascertain the needs and adaptabilities of the various kinds of land and land conditions, a new system of classification has been devised to serve as the basis for developing blueprints of conservation. This system is known as the land-use capability classification. Degree of slope, kind of soil, severity of erosion, stoniness, wetness, organic-matter content, acidity, and other readily determinable physical and chemical characteristics enter into the calculations involved. Many millions of acres in the United States already have been mapped for land-use capabilities and put into practical use.

I can think of few things that would hold more possibilities of good for the Americas than a careful survey by all the nations of their lands, working together according to this standardized system of land classification. Then hemisphere planning would really be possible—then truly ordered production of farm and other crops could be accomplished.

America is rich in possibilities. It contains many types of land, every kind of climate: the Temperate Zones and the Torrid Zone with its tropic and subtropic belts. Agriculturally, all these regions have their possibilities. There are mountains, high plains, valley lands, and coastal lands. In other words, the Americas have the soil, topography, climate, and rainfall to produce practically every important crop known to mankind.

The Americas contain also a surprising area of land that has never known the plow—land rich in possibilities, that for economic or other reasons is yet to be developed. Such a survey as I have proposed would show how much of this land we have, where it is, and what we could and should do with it. There is a fair

amount of idle undeveloped land in the United States, but there is a great deal more in certain parts of Central America and South America. The coastal zone, known as the Littoral, in many cases offers splendid opportunities for agricultural development, as do some of the great valleys that stretch far inland.

More Crops From the Littoral

Being generally low, the Littoral is often humid, although this is not everywhere true. A narrow strip down the coast of Ecuador, Peru, and the northern part of Chile has low rainfall, as does a part of the lower Argentine coast. However, a good portion of the coast of Latin America has an annual rainfall of 40 inches and up, and in many places the coastal rainfall reaches 60 and 80 or more inches a year. Such areas are in some respects similar to the Amazon Basin. Often these lands, which are relatively undeveloped agriculturally, have excellent soil.

A great deal of the Littoral in the tropic and subtropic belts under wise land-use policies and with farming methods designed to conserve the soil resources—and water resources, too, where water supply is a problem—can become highly productive agricultural territory. I have no doubt that the same things that have been found true in the United States will be true elsewhere: Conservation farming methods, such as contour cultivation, or terracing where necessary, and other soil-maintenance and soil-protection measures will not only conserve these valuable resources but will increase yields as well.

Developing Agricultural Potentialities

Much of the Littoral, particularly in the warmer regions, thus developed and wisely cultivated, can produce many crops for which there is a tremendous market. These crops include cacao, coffee, bananas, balsa wood, kapok, cinchona bark for quinine (at somewhat higher elevation), tapioca, rotenone-bearing plants, spices, gums, and many others, including the vegetable oils which are so greatly needed today for military purposes. In the coastal zones of high rainfall, rubber—a key commodity in the world now—can be grown in localities of good, well-drained soil.

It will take a lot of work to develop these agricultural potentialities: Land will have to be cleared, and in many places it will have to be drained. In some spots, sanitation measures will have to be effectively established, as was done in Panama. And the soil resources will have to be protected by wise land use and land management policies and comprehensive conservation methods for protecting and maintaining the soil and developing bigger crop yields.

Soil conservation in the Americas means simple practices now—the conservation measures that give bigger yields, per acre and per hectare, of the crops that are needed to sustain democracy and maintain the land in decent condition until the abnormal demands of war are satisfied.

Fortunately, the simple practices that are needed for today's job provide an excellent foundation for the bigger job of tomorrow—the thorough conservation program that should be undertaken throughout the Americas after the war. This means: farming the land according to the crops or other uses for which it is best suited; terracing land that cannot be safely cultivated otherwise; contour cultivation and strip cropping on lesser slopes; reforestation of woodland that should never have been cleared; returning to grass the grasslands that should never have been plowed; the control of floods at their source, and prevention of sedimentation which fills up and ruins reservoirs and streams and ditches; conservation of wild life, to maintain the ecological balance of nature; conservation of natural water resources; bringing into cultivation good idle lands that never have been utilized, in order to offset the land that must be taken out of cultivation; drainage or irrigation in the regions where they are necessary; and always the maintenance of the soil itself—putting back into it the richness that is taken from it—by liming, manuring, fertilizing, and the use of good rotations.

To do all that needs to be done by way of soil conservation throughout the Americas will be a gigantic job. But it is eminently worth doing, for this land of ours is tremendously important to all the world, today and in the years to come.

•

Venezuela has gigantic waterfalls capable of producing millions of units of electrical energy.

•

Venezuela has had compulsory education since 1870.

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The United States sells Venezuela about half of all the goods that country buys from abroad.

Crown Budding for Healthy Hevea

Because plantation rubber trees are susceptible to South American leaf blight, scientists are bud grafting disease-resistant crowns to the trunk, and the result is that trees high in rubber yield are supplied with crowns which resist the ravaging disease.

by H. G. SORENSEN

When the cooperative Western Hemisphere program to establish a plantation rubber industry in Latin America was undertaken in 1940, it was recognized that it would be necessary to wage vigorous war against South American leaf blight, the ravaging plant disease that had thwarted previous attempts. One of the scientific weapons being used successfully in that battle is crown budding, the process by which a *Hevea brasiliensis* tree that is high in rubber yield is given a crown that resists the disease. This is a temporary expedient pending multiplication and distribution of selections of the tree which combine superior yield with resistance.

South American leaf blight is caused by the fungus *Dothidella ulei*, and it is carried from one tree to another by wind-blown spores. By destroying the leaves, it decreases the quantity and quality of rubber latex and eventually may kill the trees. Since the expense of spraying with fungicides is prohibitive, the only practical control measure is to use trees that are resistant to the fungus.

Many such trees exist in nature, but very few of these are high in rubber yield. The ultimate objective of Western Hemisphere plant breeders is, of course, to develop clones or strains of *Hevea brasiliensis* in which very high yield and disease resistance are combined. This has been done to some extent, but until the selections can be multiplied, crown budding appears to offer a workable means of utilizing in the Americas imported Eastern clones that otherwise could not exist in disease areas.

Practically every commercial rubber tree is a combination of at least two trees: a seedling and a selected trunk. Since seeds cannot be relied on to transmit the characteristics of their parents, it is usual practice to start a seedling and later affix a bud that produces a trunk of a strain known to be high in rubber production. In crown budding the combining process is carried one step farther; a disease-resistant crown is bud grafted to this trunk after it reaches a height of approximately seven feet from the ground. The result is a three-part rubber tree consisting of a root, a trunk, and a crown all derived originally from different seeds.

Crown budding is an accepted horticultural practice, but until recently it has never been tried on a large scale in rubber culture. Its use in the Hevea industry was first suggested in 1926 by Dr. P. J. S. Cramer, one of the well-known rubber scientists of the Far East. Another Eastern expert, J. G. J. A. Maas, writing in 1934, reported experimental use of the practice in the control of mildew (*Oidium heveae*). Apparently the procedure never got beyond the experimental scale in that part of the world, where no disease so damaging as South American leaf blight has ever become established.

Some years before the present rubber program was undertaken by the governments of the American Republics, considerable pioneer work to combat leaf blight had already been done in tropical America by two United States firms—Ford and Goodyear—and their facilities were made available for use under the cooperative program. The Ford estates at Fordlandia and Belterra were particularly important because their location in the heart of the natural habitat of the disease had provided a favorable opportunity for the selection of resistant strains.

Experiments With Far Eastern Strains

When the Ford company began its Latin American rubber work in 1929, the first plantings were made with seeds from various regions in the Amazon Valley—from the area around Belém, from the Tapajoz River region, and from the Acre Territory. In February 1934, plants representing 53 strains of proven high rubber yield were introduced from the Far East.

It did not take long to discover that most of these Eastern clones would never make a successful rubber industry in Brazil because of their great susceptibility to leaf blight. The seedlings from the Tapajoz region also proved to be highly susceptible, but many of the Belém and Acre seedlings called for attention in no uncertain manner by growing vigorously with a full canopy of leaves among their pest-ridden neighbors.

When there was no longer any doubt about the true disease resistance of these outstanding trees, they were old enough to be tapped, and selection work was started in order to find the best mother trees combining good yield and resistance. The many selections that have been made since that time are now being multiplied rapidly for planting, as well as for use in crown budding.

Crown budding was started at Fordlandia in 1936, but

Susceptible rubber tree introduced from the Far East growing at Belterra, Brazil. This clone was crown budded at the age of 2½ years; the new crown is 1½ years old. To the left is a close-up of the trunk where new crown was grafted.

at that time only about a dozen trees were included in the experiment, and it was not expected to be of much practical importance. The trees used in the experiment were ordinary seedlings, topworked with resistant strains of *Hevea guianensis*, a native Brazilian species that often has a high degree of disease resistance.

In 1937 at Belterra, Far Eastern trees of proven high yield were topworked for the first time. Experiments were stepped up each year, and records were carefully kept, including comparison of topworked and control trees of the same clone. On the basis of these small experiments, it was decided to try the operation on a large scale in 1940. Further topwork was done in 1941 and will continue until new and resistant crowns have been placed on all of the Eastern clones except one strain that seems able to survive with its own crown and a few of the most important clones that will be maintained in their original form for breeding work.

The program now is to plant a part of all new areas with the highest yielding but susceptible Eastern clones and then crown bud them after one year with highly resistant tops. Since relatively few disease spores are present in newly cleared areas for some time, even the susceptible strains are regarded as likely to be able to make a normal growth during the first year after they have been budded without the necessity of spraying with a fungicide. The remaining areas are planted with a mixture of 15 to 20 of their own resistant and apparently high-yielding selections at a density of 300 trees per acre which will permit selective thinning to a normal stand based on yield.

The change brought about at Belterra by crown budding is portentous. Instead of partly leafless, starving trees that once marked the plantation, vigorous trees with healthy tops may now be seen. The union from crown budding is perfect, and there is no more danger of wind damage on topworked trees than on others. The circumference of the oldest crown-budded trees is increasing every year, and the yield of rubber is as much as 40 percent higher at this early stage.

Encouraged by the success of these operations, Department of Agriculture rubber scientists have begun to do some crown budding at the cooperative rubber experiment station in Turrialba, Costa Rica, and hope to extend the practice to other tropical American countries where rubber development work is in progress.

While some early topworking was done with *Hevea guianensis*, *Hevea spruceana* and other species, it is still considered safest to topwork only with *Hevea brasiliensis* in order to avoid possible lessening of the quality of the latex. It may be that high yielding clones, crown budded after one year, may not be identical in yield to what they would have been without crown budding, but there is no reason to believe that there will be much

difference. The important thing about the procedure is that the number of disease spores will be lowered drastically by eliminating the tops of the spore-producing Eastern trees. The threat of possible development of more virulent strains of the disease will be almost nil.

In crown budding, the shoot that is to provide the new crown must be tied to the trunk in some way for support because it is extremely brittle during the first few months and may break in a strong wind, if not protected. This may be done by budding a few inches below a more or less horizontal branch of the old tree to serve as a bracer for the new shoot. In case there is no suitable branch, a piece of board can be nailed to the end of the trunk about seven-eighths of an inch above the bud, and the new shoot can be tied to this. The shoot may also be braced with an angular piece of soft wood tied into position between it and the trunk or simply supported with two pieces of stick or cornstalk.

The idea is to tie the shoot in such a way that it is almost vertical and quite secure and to do it cheaply and quickly. Naturally, shoots cannot be handled roughly during the operation. The old crown is removed as soon as the implanted bud catches and, after a few months, when the new shoot is strongly established, the stub left for bracing and tying is removed. In top budding one-year-old trees, it may not be necessary to brace the shoot, which is much stronger than when it is placed on an older tree and must develop at considerably more than its normal rate of growth.

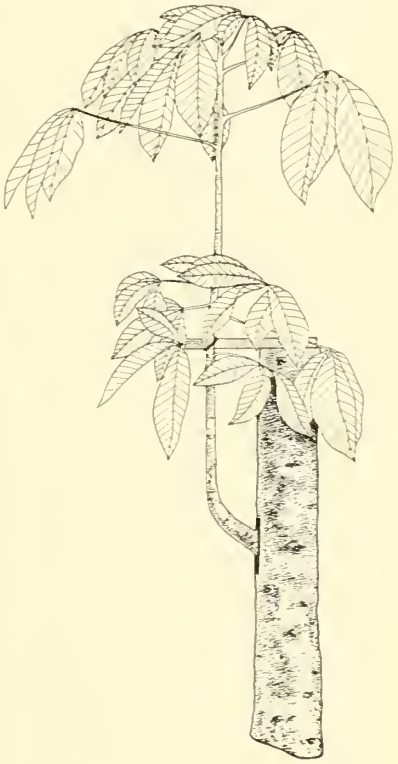
In addition to its use in disease control, crown budding may be used to speed the production of Hevea flowers needed in producing hybrid strains. This has ordinarily been done by budding on ordinary root stock and waiting six or seven years for flowering. If seedling trees four to ten years old are available, as they are in many places in Latin America, buds may be grafted to the branches of these older trees and flowers obtained within three years.

Not only is the waiting period cut down, but the quantity of flowers obtained will be greater, for it will be proportional to the age of the tree to which the shoot is attached. For instance, if a seven-year-old tree is topworked, flowers will be obtained about three years later in the quantity expected of a ten-year-old tree.

For rapid multiplication of important Hevea strains, the same method is employed. Shoots budded onto older trees that are in good growing condition should be able to produce several hundred buds within 12 months and should continue to give a high number from then on. This is in contrast with the 50 or so buds normally obtained by the ordinary procedure of budding on stock that is 12 to 18 months old.

New shoot braced against, and tied to, a piece of branch.

New shoot braced against, and tied to, a piece of board.



Tying new shoot with a wedge behind it for support.

Honduras Makes Progress

Honduras faces a new economy. For a long time the banana industry has been its claim to prosperity. Bananas are still important, but, for the future, so are its mahogany stands, its cattle industry, mining, and the new school of tropical agriculture.

by PHILIP LEONARD GREEN

It was Don Ramón Anguiano, Spain's governor of the Province of Honduras, who wrote to his king that in Honduras one could see "the largest banana in the world and the tallest corn plant." Moreover, said he, "the castor oil plant matures monthly, though it ages within a few years, and then it should be pruned to get new shoots; grapes can be harvested twice a year and have no determined season to blossom; wheat, rice, beans and potatoes can be raised twice a year; tobacco has the same rich flavor as Cuban tobacco; coffee is as rich as that of Mocha; wild cotton grows in the streets and roads; and tea like Chinese and Japanese is also found growing wild."

In addition to a lavish agricultural endowment, the Spaniards found in Honduras one of the principal seats of the unsurpassed Maya culture. The influence of the Maya and other aboriginal peoples is still visible especially in the interior where Indian strains have united with those of the Spaniard to form new racial blends, believed by many observers to hold great promise for the future development of this country.

Honduras has a fairly homogeneous population of almost 1,000,000 people. But they are widely scattered over 44,800 square miles, an area a little larger than the State of Virginia. About 105,000 families live in rural sections, compared with the 50,000 families that inhabit the towns.

As in many of the Latin American countries which have high mountain ranges, the climate of a given region is largely determined by altitude. Rainfall, forest density, and trade winds also exercise an important influence. In the interior of Honduras, by and large, it is fairly dry, and the climate is usually mild, with a mean temperature of around 70° Fahrenheit. In the hot coastal regions, on the other hand, 90° Fahrenheit is the average. The year is roughly divided into two seasons. The dry or "summer" period runs from November to March. The wet or "winter" season is from April to October. As in most other tropical countries, however, there are occasional dry spells in the rainy season, and though the rain when it does fall is heavy, one does not suffer from the interminable sieges of rain which in some temperate regions make life miserable at almost any time of the year.

Honduras is a land of many lakes, rivers, and mountain peaks. Some of the latter attain a height of 8,000 feet, giving the country not only a variety of climates but also a delightful and picturesque setting.

While Amapala is the only seaport on the Pacific side, Honduras has more ports on the northern or Atlantic coast than any other Central American republic. Puerto Cortés, Puerto Castilla, Trujillo, La Ceiba, and Tela are the important Atlantic ports. There are two distinct zones in Honduras: the northern, which centers at San Pedro Sula, served by the above-mentioned Atlantic ports; and the southern, of which the capital city, Tegucigalpa is the center. The north shore ports are only three days distant by steamer from New Orleans. Airplane routes bring the capital of Honduras to within 36 hours of the United States.

Like other Central American countries, Honduras is linked to the outside world and particularly to the United States through its exports. Chief among these is the banana. But though Honduras is famous for this fruit, it is by no means the only product that finds its way to foreign markets, for it is a land rich in minerals. The classic tales of gold so plentiful that it was once used by the miners of Olancho for horseshoes could undoubtedly be multiplied many times. Silver is usually found in mines containing deposits of sulphides, galena, and zinc blends. In modern times, other products have figured prominently among Honduran con-

New highways will make the highlands accessible and connect with the great Pan American highway.

tributions to the markets of the world. Among these are coffee, tobacco, coconuts, hides, sarsaparilla, and citrus fruits. Thus, while bananas normally constitute about 80 percent of the country's exports, other products are being developed in the hope of freeing the country from too much dependence on the single crop.

Considerable attention is being devoted to the cultivation of corn, beans, and plantains. Rice, too, is being grown with outstanding success. Tracts of land between 2,000 and 4,000 feet in altitude lend themselves to growing such Temperate Zone products as wheat, rye, oats, apples, peaches, and strawberries.

One of the most important sources of the future progress of Honduras is found in its forests where there are thousands of acres of mahogany. Other woods for which the country is famous are pine, oak, cedar, white poplar, beech, quebracho, and Brazil wood.

The United States ordinarily furnishes about two-thirds of Honduras' imports. These consist largely of gasoline, machinery, iron and steel products, foodstuffs, lumber, textiles, chemicals, and leather.

Locally manufactured products represent a wide variety of industrial activity, though naturally on a relatively modest scale. Matches, soap, beer, mineral

Sunday morning in Tegucigalpa.

waters, candles, flour, shoes, "junco" hats (a Honduran version of the "Panama" hat), canned fish, and even clothing are manufactured in Honduras.

Future Prosperity and Progress

Education has steadily progressed in recent years. There are over 530 primary schools in the towns and over 240 in rural districts; 25 normal and secondary schools; and professional schools in pharmacy and engineering. Three agricultural schools operate under private auspices, and plans have been elaborated for a school of tropical agriculture to be financed by a United States firm. This institution will be open to young men of Central America desiring to acquire agricultural knowledge that will help them solve the problems that beset farmers in that part of the world.

The future prosperity and progress of Honduras depend in no little measure on the development of its cattle industry, henequen production, and transportation facilities. Even should the war temporarily retard developments along these lines, it is believed that steps toward the accomplishment of this goal will be renewed as soon as hostilities cease.

One of the first of the American republics to declare war on the Axis, Honduras has ably demonstrated its willingness to support the United States. On August 3, 1942, an agreement was signed with the United States in which Honduras contracted to sell this country all the rubber which it does not need for domestic purposes. Efforts are being made to stimulate production of both agricultural and mineral products needed by the United States, and of certain foodstuffs required for local consumption. The more of the latter which Honduras is able to produce, the less dependent it will be on decreasing shipping space and threatened sea lanes.

Meanwhile Honduras continues to aid the allies by putting her economy on a war basis, keeping a strict watch for Axis propaganda, and maintaining a loyal devotion to the ideal of inter-American solidarity.

Reading
ABOUT THE AMERICAS

Two Thousand Miles up the Amazon, Frances Norene Ahl; 244 pp., The Christopher Publishing House, Boston, Massachusetts, 1941. Life along the world's largest river system.

Latin America and the War, Vera Micheles Dean; 63 pp., Oxford University Press, New York, 1942. Discusses the question of democracy in Latin America and suggests a Latin American program for the United States.

Mexico and Central America; South America, Harry A. Franck; F. A. Owen Publishing Company, Dansville, New York, 1937. Two readers for young people dealing with Latin America.

War and the Americas, J. V. Garland; 564 pp., H. W. Wilson Company, New York, 1941. An explanation of the present conflict and the organization of peace in the Americas.

Mexico's School-Made Society, George C. Booth; 175 pp., Stanford University Press, California, 1941. Sets forth the ideas embodied in Mexico's educational program. Mexican vocabulary.

Inter-American Solidarity, Herminio Portell Vilá, George Fielding Eliot, Eduardo Villaseñor, Arthur R. Upgren, Frank Scott, Daniel Samper Ortega, and J. Fred Rippy; 228 pp., The University of Chicago Press, 1941. This is a symposium of discussions by various authorities of Latin America and the United States, covering hemisphere defense, trade, financial problems, raw materials, cultural relations, and the place of the Americas in the world.

A United States Purchasing Commission has been established in Rio de Janeiro to carry out the various purchase agreements between the governments of Brazil and the United States, acquiring and exporting the strategic materials and other products covered by the agreements.

The Commission will represent the Commodity Credit Corporation, Rubber Reserve Company, Defense Supplies Corporation, Metals Reserve Company and other procurement agencies of this country. It will be under the jurisdiction of the U. S. Embassy in Rio.

AUTHORS in this Issue

P. K. Norris ("Cotton Becomes a Hemisphere Problem") and *Philip Leonard Green* ("Honduras Makes Progress") are members of the staff of the Office of Foreign Agricultural Relations. *H. H. Bennett* ("Erosion in the Americas") is Chief of the Soil Conservation Service. *H. G. Sorensen* ("Crown Budding for Healthy Rubber") is an agent of the staff of Rubber Plant Investigations, Bureau of Plant Industry.

ALONG THE *Agricultural Front*

▲ Dairy Survey of Latin America Begins

Dr. O. F. Hunziker and Dr. R. E. Hodgson, dairy technologists of the Bureau of Dairy Industry, Department of Agriculture, are making a survey covering the development of a dairy production and nutrition program in Latin American countries at the request of the Coordinator of Inter-American Affairs.

The party went first to Venezuela. Other areas recommended for immediate attention are Colombia, Costa Rica, Honduras, and Guatemala. It is understood that the Food Supply and Nutrition Section of the Office of the Coordinator will obtain information concerning other countries in which emergency situations may develop and where the services of the dairy technologists are required.

The specialists will gather general information regarding the dairy industry of Latin American countries which will formulate the basis for action programs to assist in relieving existing food shortages. They will also assist in the general program of helping certain Latin American countries solve their immediate food problems and recommend improved practices and principles which will bring about greater local production and utilization of dairy products.

Expanding the dairy industry in some of these countries would not only aid in developing a better-balanced agriculture but also would improve the nutritional welfare of great numbers of people now contributing their time and energy to the war effort, the Department of Agriculture said in announcing the project.

Dr. Hunziker is an international authority on dairy problems. For 23 years before establishing his own business as dairy consultant, author, and publisher in 1939 he was director of research for a Midwest creamery company. Dr. Hodgson has been a member of the research staff of the Bureau of Dairy Industry since 1930 and until recently was in charge of the cooperative breeding, feeding, and management investigations at the Western Washington Experiment Station, Puyallup.

▲ Migration of Mexican Farm Workers Into United States

The Governments of the United States and Mexico have concluded an arrangement making possible temporary migration of Mexican farm workers into the United States to help meet the farm labor shortage, especially in the Southwest. The arrangement was made by the State Department at the request of the Department of Agriculture, the War Manpower Commission, and other interested United States Government agencies.

This step has been occasioned by the shortage of farm labor resulting from the enrollment of men in the armed service, the movement of farm workers into industry, and the Government's program to increase agricultural production to meet wartime needs.

Mexican workers will come into the United States only when domestic labor is not available to meet the demand. Each worker will enter only on written contract providing that he be paid the prevailing wage rate, with a minimum of 30 cents an hour, that he be employed at least three-quarters of the time he remains in the area, and that he will return to Mexico upon conclusion of the contract. Transportation into the United States and contracts for employment will be arranged by the Farm Security Administration of the United States Department of Agriculture.

▲ New Process Freezes Beef in Six Hours

Instead of eight days, as formerly, beef can now be frozen in six hours. The patent of the new process is held jointly by the Smithfield & Argentine Meat Co. and the Corporation of Argentine Meat Producers. It includes not only the quick-freezing process, but also a method of sucking the meat before freezing into molds, which is said to reduce the required shipping space by 40 percent and to facilitate rapid freezing.

Meat is sucked by a special vacuum process into molds and then frozen in a brine-spray tank for six hours, after which it is loosened from the mold by a blast of steam and sent to the packing room for final preparation and shipment. The significant feature of this new method is the reduction in shipping space required for the frozen product.

▲ Venezuela Aids its Farmers

Financial negotiations resulting from the recent Venezuelan Mission in the United States have led to a 20 million bolívar loan to help overcome the dislocation of export trade and to purchase crops as a means of assisting farmers.

An additional agricultural credit was obtained on a long-term basis for production development through loans to be granted by the Agricultural and Livestock Bank to producers in the various branches of na-

tional activity. It is hoped that by this means Venezuela will become self-sufficient within three years insofar as agricultural commodities are concerned, and avoid the customary importation of rice, potatoes, and oilseeds.

Summarizing these financial negotiations, the Minister of Agriculture said that total credits of 106 million bolívares had been obtained at a cost to the nation of only 5,000 bolívares.

▲ BEW Sends Technicians to Latin America

Dr. Rufus Moore, rotenone specialist of the Puerto Rico Agriculture Experiment Station, has been given a temporary assignment with the Board of Economic Warfare to investigate the development of rotenone crops in Haiti, Colombia, Ecuador, and Guatemala.

Vernon Wright of the Fats and Oils Section of BEW is in Brazil studying the procurement of babassú nuts. Considerable interest is being shown in equipment for cracking the nuts mechanically in order to secure the most economical extraction.

▲ Dominican Republic Fights Sigatoka

A Dominican decree exempts all equipment, machinery, instruments, materials, and products to be used to combat the banana disease, sigatoka, from all import duties and internal revenue taxes for a period of ten years.

Although the Dominican Republic is a minor banana-exporting country, shipments to the United States have expanded rapidly in recent years. United States imports totaled 652,000 bunches in 1940 compared with an average of 4,000 bunches in the five years, 1931–35, and an average of 44,000 bunches in the 1921–25 period.

▲ Argentina Manufacturing Corn Briquets

Argentina has begun the manufacture of corn briquets for domestic and industrial fuel uses. Production of the briquets is expected to utilize the large corn surplus in addition to replacing coal imports which have dwindled from nearly 3,000,000 tons in 1939 to less than 1,000,000 tons in 1941. The corn briquets will also be used in conjunction with coal for burning in locomotives. Further diversion involves the distillation of large amounts of alcohol from corn, to be mixed with gasoline for motor-vehicle consumption.

▲ Argentine Maté Rich in Caffeine

An order for almost 11,000,000 pounds of Argentine yerba maté has been placed by an American firm as a result of chemical research establishing Argentine maté as a valuable source of caffeine and other important medical ingredients. Not only has maté been found to be rich in caffeine, but also in other substances of vitamin content, and in chlorophyll, the green coloring substance of plants which is in increasing demand for medical purposes.

▲Coffee Import Quota for 1942–43 Fixed

The Inter-American Coffee Board has announced an over-all quota for United States coffee imports during the year beginning October 1 equal to 110 percent of the basic quota fixed in the Inter-American Coffee Agreement. The basic quota is 15,900,000 bags. This would indicate a 1942–43 quota of 17,490,000 bags, with some adjustments for countries that exceed or undership their quotas during the current year. United States coffee imports during the quota year from October 1, 1940 to September 30, 1941 were approximately 16,698,000 bags.

The Inter-American Coffee Agreement, signed by the United States as a coffee importer and by 14 Latin American countries as exporters to promote the stabilization of the coffee market, is now in its second year of operation.

▲ Food Survey of Peru

Earl N. Bressman, Director of the Agricultural Division of the Office of the Coordinator of Inter-American Affairs, has returned from an extended trip to Central and South America. Following attendance at the Second Inter-American Agricultural Conference in Mexico City, Dr. Bressman, at the request of the Peruvian Government, went to that country to make a survey of the food situation. He covered approximately 6,000 miles, chiefly by plane, in making the investigation.

AGRICULTURE IN THE AMERICAS MADALINE W. NICHOLS, EDITOR

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Gabriel Turbay

OUR MUTUAL FRIEND

Colombia's Ambassador to Washington, Dr. Gabriel Turbay, will soon return to his country to assume duties as Minister of Foreign Affairs in the new administration, a position he occupied in 1937–38 under President Alfonso López, who has been recently re-elected.

Only 40 years old, Dr. Turbay has packed into his career 21 years of brilliant and varied public service. Completing his medical studies at the National University of Bogotá, the Athens of South America, Dr. Turbay entered public life as a Deputy to the State Assembly of the Department of Santander. From then on, any biographical data of the Ambassador must be an inventory of the most prominent positions that a nation can offer its gifted citizen.

In the House of Representatives and the Senate, where he served on several occasions, he was a recognized leader of the Liberal Party. He was also President of both Houses. In 1933 he served as Minister of the Interior, and later as Minister of Foreign Affairs. In between he acted as Chairman of the Colombian Delegation to the League of Nations. Add to these, the vice-presidency of Colombia for two terms and the chairmanship of the Liberal Party on various occasions, and the political frame is well-rounded.

Nor is the diplomatic scene a novelty to Colombia's well-traveled Ambassador. Before he accepted the Washington post in November 1939, Dr. Turbay had served as Minister of Colombia in Belgium, Italy, and Peru. He speaks French, Italian, and English.

Even a cursory sketch reveals that Dr. Turbay is a singularly talented combination of diplomat, statesman, and scholar. In temperament and personality he seems to reflect the character of his country: liberal, alert, intellectual, intense.

And now, almost three years after presenting letters of credence to President Roosevelt, Dr. Gabriel Turbay is returning to Colombia to be Minister of Foreign Affairs.

Postage Rates

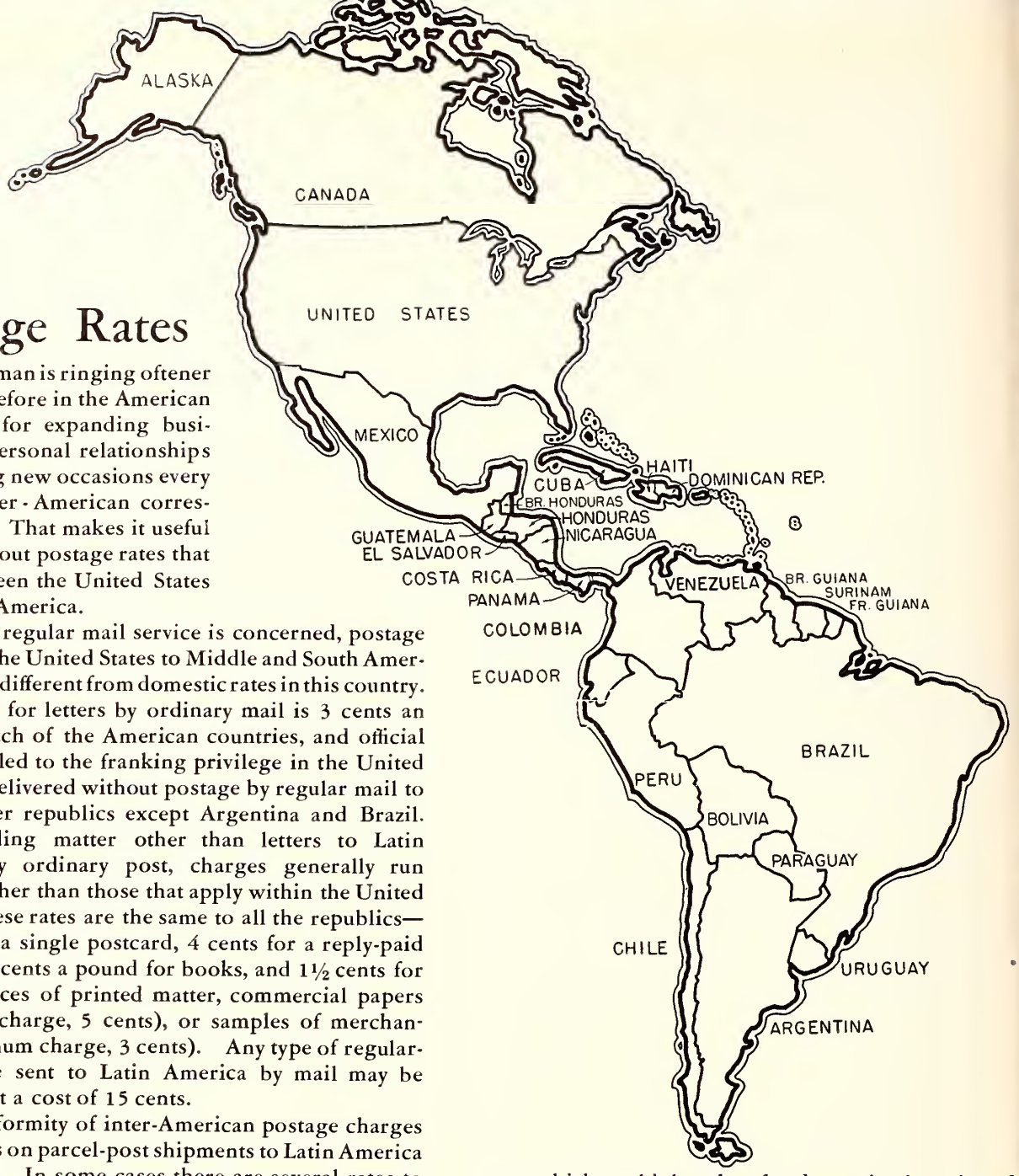
The postman is ringing oftener than ever before in the American Republics, for expanding business and personal relationships are creating new occasions every day for inter-American correspondence. That makes it useful to know about postage rates that apply between the United States and Latin America.

So far as regular mail service is concerned, postage rates from the United States to Middle and South America are little different from domestic rates in this country. The charge for letters by ordinary mail is 3 cents an ounce to each of the American countries, and official letters entitled to the franking privilege in the United States are delivered without postage by regular mail to all the other republics except Argentina and Brazil.

For sending matter other than letters to Latin America by ordinary post, charges generally run slightly higher than those that apply within the United States. These rates are the same to all the republics—2 cents for a single postcard, 4 cents for a reply-paid postcard, 5 cents a pound for books, and 1½ cents for each 2 ounces of printed matter, commercial papers (minimum charge, 5 cents), or samples of merchandise (minimum charge, 3 cents). Any type of regular-mail article sent to Latin America by mail may be registered at a cost of 15 cents.

Here, uniformity of inter-American postage charges ends. Rates on parcel-post shipments to Latin America vary widely. In some cases there are several rates to different parts of the same country. The range is from 14 cents for the first pound on packages sent to Argentina, Costa Rica, Cuba, Mexico, Nicaragua, and part of Uruguay to 55 cents for Ecuador, Guatemala, and Peru, 57 cents for some areas in Venezuela and 71 cents for El Salvador. Postal regulations require that international parcel-post shipments be brought to a post office for mailing.

Of course, a great deal of inter-American correspondence, both private and official, is carried by air, particularly since the war situation may cause delay of regular mail. Publication of airplane schedules between the United States and Latin America has been suspended until further notice, but air mail continues to travel, and there has been no change in the postage rates, which are higher than for domestic air mail and vary with the distance flown.



International air-mail letters need to be kept light, for rates are based on a half-ounce weight unit. The rate to Argentina, Brazil, Chile, Paraguay, and Uruguay is 40 cents for each half-ounce. To readily accessible Ecuador and Peru it is 30 cents, the same as the rate to Colombia. The hop across the Caribbean to Venezuela requires only 25 cents, the lowest air-mail rate to any South American country.

Fifteen cents carries a half-ounce letter by air to the Central American Republics of Costa Rica and Panama. To El Salvador, Guatemala, Honduras, or Nicaragua the rate is 12 cents; to the rest of Middle America—Cuba, the Dominican Republic, Haiti, and Mexico—it is 10 cents.

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Agriculture in the Americas

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IN THIS ISSUE

November 1942

NAMES & NEWS

New Ministry of Agriculture

One of the most important advances made in Costa Rican agricultural economy is signaled by the creation of a separate Ministry of Agriculture, headed by *Mariano Montealegre Carazo.* Under the new organization it will be possible to unify all of the agricultural programs under one head, and facilitate closer collaboration with the many technical experts from the United States and increased agricultural production in Costa Rica. Formerly the Ministries of Agriculture and Public Works were combined.

The contemplated reorganization includes a new General Bureau of Agriculture, directed by *Juan José Herrero,* and a Department of Statistics, headed by *Raúl Velásquez.* The Director of the National School of Agriculture is to be *Rafael Chavarría.*

Agriculture Library Plans

The Library of the United States Department of Agriculture has prepared a list of the some one thousand titles of basic works for the use of United States scientists in the Latin American field. Grouped in a general reference section and in sections corresponding to the agricultural products of local interest, such a library would prove an extremely important tool not only for the efficient work of United States scientists, but also for the reference work of their Latin American colleagues to whom the collections could be made available.

Also prepared is a long list of the technical journals of agricultural interest already received by the Library of the Department, with indication of specific numbers needed to complete files for the several Latin American countries. *Mr. Ralph R. Shaw,* Librarian, is eager to complete a collection which is already of outstanding importance; he would be happy to arrange extensive exchange of agricultural technical material.

Agricultural Missions

Lee Hines, Lewis E. Long, and *Lewis P. McCann,* of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, will leave for Ecuador in the near future. They will work on the organization and start operation of the new experimental station near Quevedo, of which Mr. Hines is to be Director, and Mr. McCann, the horticulturist. Mr. Long will be the specialist on organization technique and personnel training. The present headquarters of the work are at Quito.

The Special Rubber Investigations Project of the Bureau of Plant Industry, United States Department of Agriculture, which is cooperating with corresponding agencies of some fourteen Latin American countries to further the establishment of a permanent, self-sustaining rubber-producing industry in the Western Hemisphere, reports the following changes in personnel:

Russell J. Seibert has returned from Haiti, where for the past year and a half he has been in charge of the Cooperative Rubber Plant Field Station at Marfranc, Haiti, and where his work has been closely coordinated with the hemispheric program for the development of plantation rubber production.

Hans G. Sorensen returned on September 30 from the Dominican Republic, where he conferred with agricultural officials and inaugurated a cooperative rubber investigational program. This program has been greatly facilitated by

{Continued on page 220}

Agriculture IN THE *Americas*

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New Education in Tropical America

Tropical America needs men prepared through intensive training to face the urgent problems of agricultural development and crop improvement. Inter-American cooperation may provide the opportunities for such education.

by WILSON POPENOE*

During the past few years I have had opportunity to travel rather widely in tropical America, from Mexico on the north to Ecuador and Venezuela on the south. I have been particularly interested in agricultural education. For that reason I have made it a point to visit agricultural schools and educational centers.

Based upon these travels and visits, I wish to consider some of the problems of agricultural education as seen through the eyes of one whose background is not pedagogic but who is devoted to the practical side of tropical agriculture. I am confining myself to a consideration of the problems existing in the Spanish-speaking countries of tropical America; I am not so familiar with the others. My remarks will be based upon two premises: (1) there is need in the tropical countries for more and better agricultural education of the practical kind, and (2) there is insufficient opportunity for specialized training of technical workers.

From the elementary schools upward, there is a crying need for better agricultural texts in the Spanish language. As regards the primary schools, this need is perhaps not universal. I believe there are several countries well-equipped in this respect, and their texts may well be used in neighboring countries. But what about more advanced texts? How is the student in Colombia, or Venezuela, or Costa Rica, unfamiliar with languages except his own, to be given a solid groundwork in such branches as soil science, or crop improvement, or the identification and control of agricultural pests and diseases? In many instances, texts should be adapted to local conditions. In all instances, they should be modern and practical. I have no hesitation in asserting that here is a field of action which merits long and devoted effort on the part of all of us who are interested in the agricultural development of the tropics.

Admittedly the need is not acute in some regions and with regard to some subjects. But in one Central American agricultural school with which I happen to be familiar, so few good texts are available that the teachers have had to provide practically all their classes with brief improvised outlines in mimeographed form. Drawing upon foreign sources of information, they have attempted to adapt general principles to local conditions and to put the information in language intelligible to local youths; for there are many differences in terminology and usage from country to country. Such a procedure, admirable in some respects, throws a responsibility upon the teachers which many of them are ill-prepared to shoulder.

Training of Teachers

The tropical American republics have done, and are doing, an extraordinarily good job with regard to the preparation of teachers for elementary schools. Citizens of these countries show an unusual aptitude for this work. Give them simple, practical texts, adapted in each case to local conditions, and I am confident these teachers can instill into their pupils as much information, as deeply rooted a love of the land and its products, as any group of teachers in the world.

If we fail to make the most of our opportunities with regard to more advanced teaching of the agricultural sciences, I believe it is largely due to the fact that insufficient attention, in some instances, has been devoted to the training of teachers for this work.

Often, attempts have been made to solve the problem by bringing teachers from abroad. For one reason or another, the majority of those brought from the temperate zone fail to stay. It has therefore become the conviction, in several countries which I have visited, that the way to face this problem is to train teachers locally—or to send

*Adapted from an address at the Second Inter-American Agricultural Conference.

local men abroad for training. When teachers are nationals of countries in which they teach, they are likely to remain in those countries throughout their lives, and (to their everlasting credit!) they are usually imbued with a patriotic fervor and sense of obligation which cannot be expected of a foreigner.

It is the ideal method; but to put it in practice is not a simple matter. How are these men to finance their education abroad? Teachers, as a rule, do not come from those classes of society which have abundant financial resources, and governments are usually slow to provide funds for such purposes.

May I mention one more problem? The salaries paid teachers in most countries, including those of the temperate zone, are commonly lower than those paid by commercial interests.

One or two countries with which I am familiar have faced this problem squarely, by paying salaries adequate to meet the needs of teachers—adequate to secure the services of firstclass men. It seems to me that this is the first step which should be taken.

All tropical countries have recognized for years the need of more well-trained technical agriculturists. The usual procedure has been to bring "experts" from the temperate zone, usually on contract for a relatively short period of years. This system has sometimes proved reasonably satisfactory; more often it has not, and I believe it fair to say that there is a growing sentiment against it in many regions. This is a healthy sign—a sign of an awakening consciousness of opportunity and of duty.

We North Americans may still help; but we must not be afraid to face criticism when it is just and when it is constructive. What do they say about us in the tropics? Let me quote the words of a group of young agricultural workers in one tropical country where I have spent much time these past few years.

They say: "Our problems can be solved only through the application of more technical knowledge than we possess today. For example, we need to know more about rice culture. We need to improve our technique in the selection and propagation of cacao varieties. We need to know more about our soils. We need more knowledge of insect pests and their control. How are we going to bring good ability, training, and experience to bear upon our problems?

"If we bring men from abroad to help us, we have to pay them large salaries. During the first year or two, they must devote most of their time to becoming familiar with conditions in our country. Often they are handicapped by not knowing Spanish, a handicap which means that they are not wholly effective in passing on to our agriculturists the information they have brought with them. And then—and this is the most serious feature of all—they usually go home at just about the time they commence to be useful to us.

"Recognizing that there have been exceptions and recognizing that in some instances we should still resort to this method of approach, we feel nevertheless that our case is a strong one. Instead of bringing men from abroad, why not use the same money to send us to Trinidad, to Chile, to Mexico, to the United States, or wherever are to be found the best men in any given field of specialization? Given the opportunity to study

Courtesy of the Peruvian Ministry of Foreign Relations

National School of Agriculture at Lima, Peru.

under real experts, we believe we have the ability to become proficient. And when we come back, we are here to stay. We belong to the country; we speak the language; we understand the psychology of the people; and above all we yearn to assist in the development of our national resources."

Agricultural Collaboration

We North Americans can help by making it possible for these young men to prepare themselves for more efficient service. Here is one of our greatest opportunities so far as the development of Latin American agriculture is concerned.

I do not mean to say that nothing has been done. Much assistance has already been given; more is in the making. At the Second Inter-American Agricultural Conference recently held in Mexico we discussed what promises to be the greatest step yet taken: the creation of the Instituto Interamericano de Ciencias Agrícolas. This splendid project—for which I feel we should all take off our hats to the Honorable Henry A. Wallace, Vice President of the United States of America, whose devoted interest and enthusiasm have fostered the idea—promises to bring within easy reach of many Latin American youths precisely the sort of training they need, under conditions of climate and soil more or less representative of their own countries.

But despite the Instituto Interamericano, assistance will still be needed by those who wish to perfect themselves in specialized fields of endeavor. There will always be cases where a man must go far afield to study under the leading expert in his particular line. He may need to go to Trinidad, to study cacao under Cheesman and Pound, whose fifteen years of research have placed them in the lead with regard to the scientific cultivation of this crop. Or he may need to go to Florida, to study tropical soils under Allison; or to California, to profit from the rich experience of that State in the investigation of drainage and irrigation techniques.

Lacking funds of his own, how is he to realize such an ambition? Partly by his own efforts, assuredly; partly through the support of his government; partly through the generosity of Colleges of Agriculture and other institutions which are now assisting Latin American students in many ways; partly through private philanthropy.

In this last connection, I wish to pay homage to David Burpee of Philadelphia, whose public-spirited action is worthy of emulation on a wide scale. The creation of the Burpee Scholarship in Horticulture at the Florida State College of Agriculture represents one of the most useful and practical types of assistance which can be offered to Latin American youths. This scholarship takes one man to Florida each year and gives him an opportunity to study whatever courses he and his advisors feel will best prepare him for the particular kind of horticultural career he plans to follow.

We can feel encouraged by the progress which is being made. Venezuela has recently opened a school for higher education in the agricultural sciences. Puerto Rico has its highly successful College of Agriculture at Mayagüez. Colombia has two similar institutions; Costa Rica, one; Nicaragua is planning one. The National School of Agriculture in Mexico has been functioning successfully for years. Cuba has a school of agriculture affiliated with the University of Havana.

Then there are the vocational schools of agriculture, which to my way of thinking, are equally important. They are to be found in many republics. Guatemala has one, now being moved to a new and better site. Nicaragua has one at Chinandega. In the republic of Honduras, the United Fruit Company has donated funds for the establishment of one to be known as the Escuela Agrícola Panamericana; essentially a vocational school, it may also be able to offer limited opportunities for specialization in certain subjects. Cuba has a number of such vocational schools of agriculture, known as "Granjas." Venezuela has one at Maracay. Ecuador has the excellent Quinta Normal de Agricultura at Ambato. This by no means exhausts the list.

Cooperation from the United States is becoming more and more active and effective. The Coordinator of Inter-American Affairs is doing a great deal. Twice a year the President's Committee on Inter-American Cooperation in Agricultural Education meets at Washington to discuss ways and means of furthering the general program. More and more scholarships are being offered; more and more agricultural colleges are cooperating by waiving the usual fees for nonresident students and offering facilities of various sorts.

More than ever before there is an appreciation of the needs and opportunities which exist in the field of Inter-American cooperation in agricultural education. More than ever before, energetic steps are being taken to increase the facilities available in the tropics and to provide assistance for students who need intensive training in specialized branches of agriculture. But let us make sure our orientation is sound and practical. What we want, in tropical America, is men prepared through intensive training to face the urgent problems of agricultural development and crop improvement. These men must have not only a sound theoretical preparation; they must be familiar with the practical aspects of the work as well. To achieve this latter objective, they need a chance to work closely with men of outstanding ability and long experience in their respective fields. Inter-American cooperation may provide them with such opportunities.

Agrarian Cooperatives in Peru

Mounting evidence shows that properly organized cooperatives, adapted to the needs of farmers in the regions they serve, can be of great importance in Peruvian agriculture. A new governmental agency fosters this development.

by ALEJANDRO MACLEAN Y ESTENOS

Agrarian cooperatives were known in Peru even before the Spanish conquest. The *ayllus*, or clans, of the ancient Incas were embryonic cooperatives, bound together by blood, lands and beliefs, as well as by cooperative work. The great irrigation works of pre-Spanish Peru were community enterprises. Farm workers sowed and harvested their crops together and owned their primitive farm implements in common.

After the Incas, cooperative agricultural action slowly disappeared in Peru, but the initiation of President Manuel Prado's regime in 1939 gave new impetus to the cooperative movement. In one of his early addresses as President, Dr. Prado termed the cooperative system "of vital interest for our agricultural production." "Agriculture," he said, "as one of the oldest and most important industries of the American republics, cannot ignore the cooperative organization . . . which . . . places the producer in direct relation to the consumer, stimulates the sound development of natural resources, and holds out to farmers the hope of improved living."

Cooperatives have been authorized under Peruvian law for a number of years, but there was no national agency to foster them until June of 1941 when, by presidential decree, a special branch of the Ministry of Development was created to encourage, organize, and supervise the agricultural cooperatives of the country. This agency is the Agricultural Cooperative Section of the Bureau of Agriculture and Animal Industry. With its creation, the government, to quote a Peruvian writer, "assumed the direction of a crusade that may produce a revolution in the agriculture of the country." In the few months since then, it has been possible to see some of the beneficial effects.

The first organization to register with the new Section was the Cooperative of Cañete, formed in October 1941 in a cotton region of southern Peru. Its inauguration was celebrated with an impressive ceremony, attended by many officials of the national government. The Cañete organization is a general cooperative, authorized to sell the products of its members and buy for them articles of consumption and general use. It is charged particularly with seeking new outlets for cotton produced by members.

The agricultural cooperative of Palpa in the Province of Ica, formed with the assistance of President Prado, was recognized by the Cooperative Section on October 22, 1941.

On the same date there was established the Caja Rural (Agricultural Credit Cooperative) of Mariscal Cáceres, organized by a group of farmers in the Province of Huancavelica and having as one of its objectives the organization of similar institutions in neighboring towns. Its primary function, that of obtaining credit for its members for agricultural production, may well prove to be one of the greatest virtues of an expanded agricultural cooperative system in Peru.

In Peru, the small-scale farmer has quite as important a part in the national well-being as the farm operator of large capital and big acreages. Adequate credit is essential to these small farmers, but it cannot ordinarily be provided satisfactorily through private lending agencies, which in most cases are far removed from the agricultural areas where loans are made. Since the only security possible is the success of the farming operation financed, loans made under such conditions are expensive for the borrower and risky for the lender.

Peru hopes to overcome the difficulty through the formation of agricultural credit cooperatives, which have solved the small farmer's credit problem in many parts of the world. Money is lent to the cooperative, which in turn makes loans to its members. The system is equally effective whether the lending agency is an official institution or a private organization.

The foundation of the Agricultural Bank of Peru in 1939 constituted a great step taken in the direction of providing adequate credit to the nation's small farmers. During the agricultural campaign of 1940–41 the Bank, according to its last report, made loans totaling 31,824,823 soles (approximately $4,896,000), the largest amounts of which were for the cultivation of cotton and rice. Loans were made in the fertile valleys of the coast, as well as

in the less developed sierra and mountain regions, and were granted for both livestock and crop production. Under its special authority for making loans to small-scale farmers, the Bank during the 1940–41 season lent 2,362,064 soles, distributed in 992 individual loans.

The expansion in the number of Peruvian cooperatives is expected to increase greatly the Bank's opportunity to be of service to small farmers. It is authorized to make five-year loans (which may be extended to ten years) for the planting, cultivation, or harvesting of crops and loans to livestock men for the purchase of breeding stock or the fattening of cattle. In both cases loans are limited to 7 percent of the value of the crops or livestock by which they are secured.

The campaign for the organization of cooperatives was intensified several months ago, when the Bureau of Agriculture and Animal Industry sent a representative into the southern regions of Peru. For four months he visited the various agricultural valleys. One of the results of his trip was the addition to Peru's cooperative family of 20 new societies in the Department of Puno.

These 20 cooperatives are localized in the province of Huancané, one of the richest and most productive in Puno, and their organization should serve to encourage the unification of farming and livestock production methods throughout the area. The Huancané groups will give special attention to intensifying the cultivation of quinine, which is considered one of the most promising crops for development for the export market. They are also interested in the seeding of pastures, the improvement of which is one of the chief hopes of enlarging the national livestock industry.

Renewed interest in cooperatives has provided evidence that Peru's Indian population is not indifferent to the evolution of modern methods in agriculture, as is often believed mistakenly. In Puno, Cuzco, and Abancay, where community celebrations have marked the organization of cooperatives, Indians have been among the most enthusiastic participants, often displaying posters lauding the government's agricultural program and leaving no doubt of their reaction to the ideals of the cooperative movement.

Members of an agricultural cooperative in southern Peru begin their field labors. In a year's work the cooperative movement, in its official form in Peru, has organized 45 agricultural cooperatives which have a total of more than 4,500 farmers.

The rolls in the Agricultural Cooperative Section continue to grow. In February 1942 was created the Agricultural Cooperative of Camaná, which embodies a number of new features—the cooperative milling of rice, the rehabilitation of land for new cultivations, and an arrangement with the Compañía Administradora del Guano for the direct delivery of fertilizer to members.

In the organization of La Aurora del Campesino of Recuay Huaraz, an agricultural and livestock cooperative established early this year, the members paid their fees in cattle, more than 50 of which were contributed. This organization provides facilities for the interchange of products among members as a means of eliminating "in-between" charges. A saving to members of at least 15 percent on products purchased in this way rather than in public markets is estimated.

So it goes throughout the different zones of Peru. There is mounting evidence that properly organized cooperatives, adapted to the needs of farmers in the regions they serve, can be of enormous importance in fitting the agriculture of the country into new and evolutionary moulds.

Indians in the province of Huancané (Puno).

Peru Shares in Agricultural Defense

by SENEFELDER P. VALLEJO E.

Because of the tragic struggle which casts its dark shadow over the world, cooperation and solidarity among the American countries in the field of agriculture have acquired far-reaching importance. The war has demonstrated that the Latin American countries are capable of cooperating actively in supplying essential raw materials that can no longer be obtained from European and Asiatic sources.

Peru is much interested in increasing its capacity to supply some of the commodities that are needed. We appreciate the necessity for developing our agricultural resources to the full extent of our possibilities, in order not only to regain lost markets for rubber and quinine but also to secure new outlets for other agricultural products.

Aside from its present exports—principally of cotton, sugar, coffee, and a few other products—Peru is capable of producing and exporting many other commodities on a large scale. These include quinine, quinua, barbasco root, cacao, coca leaves, tea, tapioca, kapok, cumin, paprika, sage and various fibers, including sisal, henequen abacá, hemp, and flax.

Because of our interest in the production of new crops, we have welcomed the visits of several commissions sent by the United States Department of Agriculture to Peru, as to other tropical American countries, to survey the agricultural regions and assist with advice and experience in solving agricultural problems. In 1940 a commission of rubber experts visited Peru for this purpose and presented an encouraging report to the government. A new mission arrived in 1941 at the invitation of the Peruvian Government to study agricultural crops with particular emphasis on plants yielding products for industrial use. More recently, our two governments have agreed on cooperation in the establishment of a tropical agricultural experiment station.

Peru stands in the front rank among the regions of South America in the introduction of modern methods as a means of improving its crop and livestock industries. We welcome the help of the United States in improving these methods still further so that we may play our full part in the agricultural defense of the Western Hemisphere.

Electricity at Work in Rural America

Latin American engineers visit the United States to study rural electrification as an aid in increasing agricultural supplies during the war and in minimizing hand labor on the farm.

by HAROLD HARTOGENSIS

"Our hemisphere has been attacked, and we have taken up the Axis challenge . . . Our hemisphere has contributed fighting men and will contribute more. But we are also the supply base for all the United Nations. They depend upon us for weapons, for raw materials, for ships, for medical supplies, and for food."—Secretary of Agriculture Wickard at the Second Inter-American Conference on Agriculture, in Mexico City.

War has brought blackouts to some places in the Americas. And war has pointed a warning finger at other dark, unelectrified areas where men toil slowly, inadequately, gropingly, in a power age. In peace and war, these dark areas will be social and economic sore spots—holes in the hemisphere's armor. German and Japanese farms, like their cities, are almost completely electrified. Where it is without power, rural America fights on unequal footing with its Axis enemies.

A significant meeting took place recently in the St. Louis, Missouri, offices of the Rural Electrification Administration of the United States Department of Agriculture. Members of a special commission named by the Provincial government of Manitoba, Canada, had arrived to survey, with the aid of Administrator Harry Slattery and other REA officials, the growth of the REA to its present point of serving a million farm families. The Manitobans foresaw possible use of REA techniques in post-war rural electrification of their province. As the Canadians emerged from Mr. Slattery's office, they were greeted by a rush of Spanish voices. For, a few days earlier, clipper planes and trains had brought a group of young men from nations to the South—the second annual

Latin American engineers in training with the REA. Left to right, standing, are: Jorge Arias, Guatemala; Héctor Cerna, Honduras; Roberto Ladd, Mexico; Alfredo Bebin, Peru; Roberto Acosta, Cuba; Mario Gil, Uruguay; José Rivas, Panama; Fernando Romero, Colombia; and Federico del Ponte, Argentina. Seated, left to right, are: E. V. Caton, Chief engineer of the Winnipeg Electric Co.; Emerson P. Schmidt, Chairman of the special commission; REA Administrator Harry Slattery, and John W. Sanger, Chief engineer of the City of Winnipeg hydroelectric system.

J. W. Willcutt (left), Engineer of the Pearl River Valley Electric Power Association, watches as three of the 1941–42 Latin American engineers survey on the co-op lines. Left to right, the trio are: Benjamín Hernández, Honduras; Ernesto Ayala Oliva, Chile; and Francisco Villar Matthis, Argentina.

corps of Latin American engineers especially selected by their respective governments to work and study with the REA. North had met South in the campaign to light up all the Americas.

Here was evidence that many nations were thinking about the need for rural power. Last July, engineers from Argentina, Mexico, Chile, Peru, Colombia, Honduras, Uruguay, and Guatemala had completed their year's work with REA. Their places have been taken by new engineers not only from these nations, but from Haiti, Cuba, and Panama. Eighteen Latin Americans will be studying in St. Louis when the program is in full swing.

The reason for this enthusiasm is clear: REA's program has indicated a way to end the hand labor on farm and home that still makes semi-slaves of so many millions of rural families on both continents.

Back to Mexico from St. Louis in July went Antonio Elizondo, employee of that nation's Federal Electricity Commission, with a pattern for electrification of rural Mexico based on his experiences at a typical REA electric cooperative in Illinois and in the REA engineering divisions. As in the case of the United States program, war may delay Mexico's plans—but Señor Elizondo has the technical experience and the blueprints. He will recommend adaptation of the United States cooperatives' model bylaws and constitutions to Mexico's laws; adaptation of our meters to suit the varying consumption pattern of potential Mexican users of electric power. Since many Mexican farmers live in villages, with their farms clustered round about their dwelling places, Elizondo foresees low-voltage generation without long, expensive power lines, transformers, and substations. And, from the consumer angle, he foresees radio recasting the social life and outlook of Mexican farmers.

So, too, does Ernesto Ayala of Chile look ahead. His nation is forming rural electric cooperatives, and Señor Ayala believes his field study of typical Arkansas rural electric co-ops will enable him to be of service in his own country. Having seen at first hand what wonders electric milk coolers and water pumps can work for Mississippi dairymen, Benjamín Hernández of Honduras thinks of the milk lost by souring in his hot, damp country; the gallons of water that Honduran coffee plantation workers have to carry; and their long hours of grinding beans by hand. Francisco Villar of Argentina wonders what electrified repair shops would mean to farms on his nation's broad pampas. Luis Cagno of Uruguay is interested in REA's methods of long-term financing of electrification. He has studied carefully the standardized methods by which REA extended rural lines to remote areas and generated power by small hydroelectric generators. These methods, he thinks, can be applied to his nation's isolated communities.

This year the Latin Americans will get a close-up of United States farms at war. They will find farmers sacrificing their power lines to enable extensions to go to Army camps. They will find every kilowatt of energy being used to pump more water; to produce more milk, more eggs, more vegetables, and more pork; to light more henhouses, to milk more cows, and to do other badly needed production jobs. Extension of electric lines to additional United States farms has been halted because of the shortage of materials, but every mile of line already strung has been pressed into extra service. In a sense, then, the Latins will get a more inspiring picture of the value of rural cooperation than would have been the case if they had come north at the height of rural line-building. They will learn what "fighting the Axis" means to rural neighbors in the United States.

Last year's engineers found one of their most satisfying experiences when they watched a force of 2,000 engineers and linemen build 195 miles of transmission lines in record time across rugged Arkansas woodland to carry power from the Pensacola dam in southern Oklahoma to a new Government-financed aluminum plant in Arkansas.

REA will continue to build such lines for the nation's welfare, and, as far as possible, the Latins will be enabled to participate in the building. Thus they will obtain first-hand experience of the United States in a new phase and get a glimpse of the power-rich America that will grow from victory over the Axis.

Uruguay—Citadel of Progress

Social progress, based on the foundation of the economic well-being of all citizens, has become a national objective in Uruguay, a country where the people feel a personal responsibility in the practice of democratic ideals.

by PHILIP LEONARD GREEN

La República Oriental del Uruguay is the official name of a country that has stood in the vanguard of every progressive movement in the Americas. The "oriental" refers to the fact that Uruguay was at one time the eastern part of the United Provinces of the Río de la Plata. Created in 1828 as a buffer state between Argentina and Brazil, her two large and powerful South American neighbors, Uruguay has more than justified her existence as an independent state. Though only about the size of North Dakota, she has not only developed distinctive characteristics of her own, but she has made noteworthy contributions to the world in a large range of human endeavor. All American nations may well be proud of Uruguay.

Compact and homogeneous, the Uruguayan nation lives largely by farming and kindred pursuits, though a very small portion of the land is devoted to crops. Chief among these are wheat, corn, oats, barley, and flax. About three-fourths of the land is used for grazing, and around 85 percent of Uruguay's exports are animal products. The earliest packing houses and the railroads built to serve the industries producing meats and other animal products, were financed by British capital. Today, United States interests are widely represented.

The *frigoríficos*, or packing plants of Uruguay, handle a total of about 4,000 cattle and 7,000 sheep daily and employ one-fifth of the country's workers. But while Uruguay is associated in the world's markets with the processing of cattle and sheep products, she has other types of industrial establishments too, such as furniture shops, textile mills, and even tire factories. Unfortunately, she does not possess the metals and fuels required for certain large-scale industries.

Over 90 percent of the some 2,500,000 people in Uruguay are of European extraction. Of these, about a third come from a northern Italian background. Some 16,000 Germans also live in Uruguay, but the authorities have taken strenuous action against fifth columnist activity. The people as well as the government of Uru-

Courtesy of the Pan American Union

Uruguayan countryside. On the road to Piriápolis, Province of Maldonado.

guay are determined to preserve the way of life which they have not only proclaimed but also truly lived to a remarkable degree.

Uruguay is proud of her beautiful capital, Montevideo (named after the remark of the Spanish discoverer, Juan Díaz de Solís, "I see a mountain"). Mention should also be made of Uruguay's magnificent artificial parks, among which are the Carrasco National Park, just outside of Montevideo, and the Piriápolis, Punta Ballena, and Municipal parks, on the Río de la Plata.

A Social Laboratory

Uruguay has been called the "social laboratory of the Americas." She established the legal eight-hour day four years before the United States. Her constitution provides for child welfare, state care for mothers, minimum wages, compulsory vacations with pay, free medical services for poor people. She has had old-age pensions established by law since 1919. She is the only country in the world whose minimum wage provisions include farm workers.

Through autonomous state trusts, Uruguay's government also owns and runs a number of monopolies, in such widely divergent fields as banking, insurance, telephones, electric power and light, water-power, river traffic, ports, cement, alcohol, and fisheries. As an indication of official interest in culture is the Official Broadcasting Service (*Servicio Oficial de Difusión Radioeléctrica*), with a national symphony orchestra and ballet as the work of one section. The municipality of Montevideo owns the chief hotels and casinos of the city. It is a happy commentary on the caliber of the Uruguayan people that their ideals of democracy have found their way into active practice, unmistakably evident in both the country's internal life and international relations.

National Peace

Though at one time Uruguay, like so many other countries, went through a stage where internal dissentions threatened to undermine the very foundations of national life, it is now forty years since she has seen bloodshed resulting from civil strife. The traditional opposing parties, the *Blancos* (whites) and the *Colorados* (reds) still exist, but all political forces are united in their desire to maintain the forward progress of the nation on the road which she has chosen. Compulsory free education and compulsory voting have undoubtedly contributed their share in imbuing the people with a live sense of their part in making democracy work.

Political equality is reflected to a remarkable degree in the economic sphere. There are virtually no outstandingly wealthy nor miserably poor classes, though some people undoubtedly enjoy more privileges than others. Yet even such privileged classes as may exist are motivated by a social vision that goes beyond the welfare of their own kind. Unemployment does not plague Uruguay. Trade unionism as a movement does not flourish in that haven of refuge for many causes. The benefits which in other countries are inevitably linked almost entirely with the organized efforts of the workers themselves, here seem to have resulted from the concerted desire of all classes to promote the nation's progress on the foundation of economic and spiritual well-being of all its citizens.

Promotion of Agriculture

Uruguay recently enacted laws designed to build up a body of small farm owners. The land needed for this project is to be expropriated by purchase and allotted by the Mortgage Bank of Uruguay to farmers satisfying certain requirements. Holdings are to be limited to 60 acres or less, except in a few unusual cases.

In further support of her agriculture, Uruguay has established several remarkable schools and institutes. Of special note is the Phytopathological Institute (*Instituto Fitotécnico*) of Colonia, which is one of America's foremost centers of agricultural investigation. In this institute were developed some of the best strains of wheat and flax in the region.

Worthy of mention, too, is the Veterinary School at Montevideo. Uruguay also has a National Milk Institute known as "Conaprole," a word made from the initial letters of the full name—Cooperativo Nacional de Productos Lacteos (National Cooperative of Milk Products). By means of its branches, this institute pasteurizes, packs, and sells milk throughout the country.

Many of the reforms enumerated above were originally set in motion by Don José Batlle y Ordóñez, President of Uruguay from 1903 to 1907 and again from 1911 to 1915, and a staunch friend of Inter-American cooperation. But it must be said to the credit of most of those who have followed him and of the enlightened population at large, that social progress has become a habit and a trend in Uruguay. It has made headway even during the most conservative administrations.

International Collaboration

On the international front, Uruguay has likewise demonstrated her desire to work closely with the forces of democracy. The war has imposed on her the need for realigning her trade relations to a considerable degree. Normally, Great Britain was her best customer and together with Germany, took more than half of her exports, while the United States bought very little. But on July 21, 1942, Uruguay signed a trade agreement with the United States which is expected to bring certain distinct benefits to both countries. Designed to assist

during the emergency and to form a basis for a larger trade after the war, this agreement provides assurances against discriminatory tariffs, quotas, and exchange barriers to trade, etc. Uruguay gives concessions on 141 items corresponding to almost a quarter of the value of our exports to her in 1940. The United States, in turn, grants concessions on a number of commodities such as flaxseed, certain prepared meats, casein, cattle hides and skins, certain coarse wools, glycerin and a few other items, corresponding in value to about 28 percent of the imports from Uruguay in 1940.

United States exports to Uruguay consist chiefly of manufactured or processed articles, such as iron and steel mill products, farm machinery and tools, automobile parts, wood and paper products, cotton yarn, radio apparatus, refrigerators, office appliances, and aeronautical apparatus. In 1940, the United States sent over $11,000,000 worth of merchandise to Uruguay, who in return exports chiefly raw materials.

In the prosecution of the war effort, Uruguay has again ranged herself against those who threaten the safety of the Americas. It will be recalled that in 1917 during World War I, Uruguay waived the rules of neutrality in permitting Brazilian and United States vessels to remain in her waters beyond the time allotted to belligerent nations by international law. During the present conflict, Uruguay has granted the use of air bases and ports to American nations engaged in hemisphere defense.

The spirit of cooperation both with her Latin American neighbors and the United States has, of course, been mutual. Insofar as the United States is concerned, in December 1941 the Export-Import Bank allotted to Uruguay the sum of $7,500,000 to be used for the purchase of needed agricultural and industrial goods. Uruguay and the United States have raised their respective legations to the rank of embassies in recognition of the growing importance of relations between them. These relations, always cordial, are now more so than ever and bid fair to become even more strengthened as time goes on.

Courtesy of the Pan American Union

"Typical Uruguayan Landscape," by the Uruguayan artist César A. Pesce Castro. Exhibited at the Corcoran Art Gallery, Washington, D. C., in April 1940.

Courtesy of the Uruguayan Embassy

Uruguay's beautiful capital, Montevideo. A view of Pocitos Beach.

Reading

ABOUT THE AMERICAS

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The Coming Struggle for Latin America, Carleton Beals; Lippincott, New York, 1940. A partially documented account—among the first to appear—of totalitarian activities in Latin America. Their implications for the U. S.

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Sponges from a Vine

The "dishrag" gourd, or luffa, has assumed new importance under present world conditions. While formerly a small item in world trade, its emergency use may lead to the development of a useful small industry.

by B. Y. MORRISON

Among the many plants that have assumed a new importance under present world conditions is a gourd, not much grown in the United States, but commonly known here as dishrag gourd or luffa.

Native originally to India it has been in cultivation for hundreds of years and, like many other plants that flourish in the tropics, it has been carried about the world, establishing itself so well that in many countries where it now grows the man-on-the-street does not realize that it is not native to his particular country.

Its role in these several countries varies somewhat as, for example, in India where its young fruits are eaten commonly, cooked as we might cook summer squash, but in all countries the chief interest has always been, and is now, chiefly centered on the intricate mass of netted fibers which fill almost the entire fruit. These fibers may be cleaned and used for washing and scouring, as well as innumerable other purposes devised by the wit and ingenuity of the grower. Our national interest at the moment is a supply of these cleaned "dishrags" which make excellent oil filters for specialized types of motors, a supply which is rather definitely limited in amount and which must be of a quality that is definitely understood.

The problems that may possibly limit such production within the United States are dependent upon the growing conditions which exist in those areas where the number of frost-free months is great enough to assure a harvest. Like all other members of the gourd or pumpkin family, the luffa may be subject to attack by various fungus diseases and insects, but the methods of treatment will not vary greatly from the treatments for cucumbers, melons and the like.

The plant is known in many of the Latin American republics and appears to have been the subject of occasional attempts at commercial production. Two species occur commonly, *Luffa aegyptiaca* (*L. cylindrica*) and *L. acutangula*, both known in most Spanish speaking countries as *el estropajo*. The fibers of both species are good, but those developed from the first are preferred since, under good cultivation, they produce fruits of better size and fibers of better quality and length.

In giving a résumé of the best instruction for careful growth of the luffa, I am particularly indebted to Señor Manuel Ymbert of Mexico City who has made careful experimental plantings of his own in the State of Chiapas and has traveled widely in a study of this plant under all conditions. His recommendations are basic and are supported by reports from other countries as well. They represent, moreover, the reasonable and logical extension of various principles already existent in highly specialized cultures of other cucurbits.

In studying any prospective crop, the *ideal* procedure is to discover the optimum conditions and then modify one's necessities as far as may be possible.

For the greatest production of a plant extremely tender to frost, the obvious first requirement is to find a place where frosts do not occur and where there are no extended periods of low temperatures that might retard growth, but this is not an absolutely limiting factor. Practically all cucurbits prefer a rich soil with perfect drainage but one capable of retaining moisture to the extent necessary to keep growth continuous. Since this may suggest medium to light soils, it brings into mind the fact that facilities for irrigation should be considered. Reports from various experimental plantings indicate that such irrigation is more than desirable and that seeds planted toward the end of the dry season, irrigated as necessary to maintain soil moisture, will germinate well

Luffa gourd and vine.

and produce young seedlings strong enough to support the effects of the ensuing rainy season in which they must make their growth and mature their crops.

Like many other cucurbits, the luffa, left to its own devices, will grow over the ground like a watermelon or squash or clamber over shrubs and small trees like a gourd. Observation has shown that fruits produced on the ground are often irregular in form, may have stains as a result of various fungus attacks, or may even decay before maturity; fruits produced on clambering vines are likely to injury only from being misshapen when they do not hang free.

To bring such a crop under the highly artificial practices that give a maximum yield of quality fruit, Señor Ymbert and others recommend the use of carefully constructed trellises. There are no definite specifications for building the trellis save that it must be strong and with all its posts, braces, and wires planned to carry the eventual weight of the maturing fruits, a weight that will be greater before the harvest since then the fruits will be losing water and drying to some extent.

The factors desirable so far, then, are a plot of land with rich, well-drained soil, water available for irrigation, and a strong system of trelliage to support the vines. To these must be added two additional factors related to the site, a location free from all strong winds and, if possible, one near enough to the sea to insure a cool, moist atmosphere.

The growth of the crop, like that of any other crop, must begin with the best available seed. It is possible that for some time seed stocks will vary and that growers will have to undertake selection and in-breeding to establish their own seed stocks.

As with other crops it is economical to plant as many as three seeds to a hill, removing the weaker two after germination. The main stalk of the vine should be trained carefully in a vertical line until it reaches the top of the trellis which is at least 8 feet high. Lateral branches should be started on the cross wires and then allowed to go as they will, as no damage results from the intertwining of the vines. Since the hills are only 3 to 4 feet apart, this intertwining soon comes to pass and is often urged for open cross pollinations.

Pile of luffa sponges.

All reporters agree that the early flowering while the plants are small should be entirely removed. Then after the vines have grown freely and come into the mature flowering, recommendations vary. All growers agree that for the best production the number of fruits per vine should be limited, a procedure that is often followed in growing such quality fruits as cantaloupes and cucumbers under glass, to cite a related crop. There are those who recommend an immediate reduction to 20 fruits as soon as they have set and others who recommend a reduction to about 40 fruits at this stage, with a second thinning when the young fruits are about 3 to 4 inches long. The advantage of this second thinning lies in the possibility of choice and the elimination of any fruits that may be misshapen.

All good farming practices necessary to keep the vines in growth and the fruits growing toward a normal development are given as a matter of routine; the only one that might not occur to the grower is that recommended in a Puerto Rican report, namely, to reduce the foliage that might shade the developing fruits. The aim of all cultivation is the ultimate production of a uniform product with fruits between 18 and 30 inches in length with fine, flexible and resistant fibers of uniform texture.

The fruits are cut with portions of the stalk attached as soon as they are ripe, which can be told by the yellowing of the rind and the even deeper, more orange color at the blossom end. They are then placed in running water for whatever period may be necessary to rot the rind, after which they are cleaned by hand by rubbing one fruit against another until the fiber is cleaned of everything save the seeds which are removed later. The cleaned fibrous masses are then strung on wires and hung in the shade, never the sun, to dry. Before they are absolutely dry they are gently beaten to extract the seeds which are arranged in the inner placental rows. Drying is then completed and the "sponges" graded for size and quality of fiber and prepared for shipment.

There is another method in which the fruits are freed of their rinds or shells by immersion in quick lime. If this is used, a later washing in clear water is necessary.

There are no data to indicate that the luffa will become a major item in world trade, but there seems to be enough evidence to warrant the statement that an excellent small industry should develop, particularly if those in charge attend to the development of high quality strains and a processing that will guarantee uniform quality without brittleness and without blemishes.

ALONG THE *Agricultural Front*

▼Chile Starts Agricultural and Livestock Census

An agricultural and livestock census of Chile for 1941–42 is being conducted by the Ministry of Agriculture in cooperation with the Central Bureau of Statistics. The new census will be considerably broader in scope than that of 1935–36 and will contain data on a wider economic and social scale. Information pertaining to agricultural labor conditions, rural standards of living, wages, and prices will be included.

The Chilean Minister of Agriculture considers the agricultural census, which will be ready for release by March or April 1943, a vital source of information for use in planning a farm program for Chile and in helping to solve present wheat, meat, and milk problems.

▼United States—Brazil Food Production Agreement

On September 3, a two-year agreement for the execution of a plan for the development of foodstuffs production in Brazil was signed by Oswaldo Aranha, Minister of Foreign Affairs, and Apolonio Sales, Minister of Agriculture, representing Brazil, and by Ambassador Jefferson Caffery and Nelson Rockefeller, representing the United States.

The undertaking will follow a plan to be drawn up by the Brazilian Ministry of Agriculture in collaboration with North American technicians who will be placed at the disposal of the Ministry for this purpose. Designed to develop foodstuffs production in North East Brazil and the Amazon Valley, the agreement includes the following provisions: technical assistance for the increase and improvement of production of foodstuffs of animal and vegetable origin; provision of means, tools, equipment, and insecticides for the increased production of foodstuffs; establishment of an efficient extension service in accordance with modern agricultural techniques; development of irrigation, drainage, and soil conservation works; collaboration in the solution of problems of handling, storage, conservation, and distribution of food products; technical and financial assistance for agricultural colonization; and betterment of the conditions of nutrition of the population in the area.

The Brazilian Government promises to allocate more than thirty-five thousand *contos* of reis to the execution of this agreement. (One *conto* is equivalent to $50.00.) The United States Government, through the Coordinator of Inter-American Affairs, will cooperate by contributing two million dollars during the two years covered by the agreement. In addition, the Office of the Coordinator will send American technicians to work in conjunction with the Brazilian-American Food Production Commission. This Commission, which will have its headquarters at Rio de Janeiro, will consist of two members: the Director of the Division for the Development of Vegetable Production, serving as President of the Commission, and the Chief Food Production Specialist designated by the Coordinator.

Commenting on the agreement, Ambassador Caffery states: "Here we have one of the many practical applications of the principles promulgated by the Atlantic Charter, and it signifies not only a great step forward in the elimination of want, but also in exterminating the fear of want. Thus is achieved one of the objectives of our democratic governments and peoples."

▼El Salvador Regulates Cotton Production

The intensified cultivation of cotton in El Salvador has culminated in a government decree to the effect that since cotton has become a vital factor in the national economy, the "control of cultivation, processing and sale of cotton in the country is declared a public utility, which will be wielded by the Executive Power."

Under the new legislation, all cotton growers must be members of the Salvadoran Cotton Growers' Cooperative, Ltd., established in 1941; all persons, firms, and corporations ginning cotton must be licensed by the Government and must be members of the Cooperative; all cotton consumed in the Republic in the manufacture of yarns and fabrics must be bought only from the Cooperative. Penalties for infraction of these laws are so severe that there is no likelihood of appreciable noncompliance. Provisions of the law include: (a) government fumigation of all seed to be planted; (b) proper precaution by growers to control pests; (c) duty-free importation of insecticides through the Ministry of Agriculture; (d) regular reports on production and acreage figures; new developments in cultivation and other information.

In order to obtain a license to plant cotton, growers must present a certificate of membership in the Cooperative, a certificate of the fumigation or disinfection of the seed to be planted, and proof of the payment of their income and road taxes.

Through the licensing procedure the Government has a means of restricting production of cotton, but leading officials of the Cooperative who had a major part in framing the new legislation state that there is no intention on the part of the Government or the Cooperative to limit planting during 1942. It is hoped that the new legislation will lead to a forceful control of marketing of the 1942 crop, estimated at between 75,000 and 100,000 quintals.

▼Chile to Codify Agricultural Laws

The Chilean Minister of Agriculture has selected a committee of legal and agricultural experts to collect, classify, and codify all of the official regulations and laws relating to agriculture.

Although no funds have been allocated for this purpose, the hope has been expressed in official circles that the necessary appropriation will be available as soon as the new administrative organizations set up by the Emergency Law of the new administration are functioning as planned.

For membership on the Committee to Codify the Agricultural Laws, the Minister of Agriculture has selected Manuel Casanueva Ramírez, Director General of Agriculture, Eduardo Galán Nilo, Treasurer of the Agricultural Export Board, and Guillermo Valenzuela Cruz, Chief of the Department of Administration of the Ministry of Agriculture.

It is believed that the general style to be used will be similar to that used by the International Institute of Agriculture at Rome. When completed, the Agricultural code will be published and distributed by the Ministry of Agriculture.

▼Chilean Convention of Production and Commerce

On August 30, 1942, there opened in Santiago a 3-day meeting of more than 300 representatives of agriculture, industry, commerce, and mining. The occasion was the Second Convention of the Confedcration of Production and Commerce, an organization created in 1933 for the purpose of combatting the depression. The First Convention took place in 1934.

Resolutions of agricultural intcrest which were adopted at the final session of the convention can be summarized as follows:

The convention recommended a policy of increasing the production of cattle in order to augment the supply of meat and milk. It also approved an increase in the production of wheat, which it considered an essential product with which the country should supply itself as well as build up stocks so that the surplus could be exported to those countries on the Pacific coast which reserve import quotas for Chile. It urged that agriculture also be orientated toward the cultivation of truck gardens.

The most important demand of the agricultural representatives was for long term and cheap credit.

The convention declared that the income tax paid by agriculture should be established on the basis of a presumed earning of 8 percent of the assessed value of agricultural property, although the tax should be applied on the real or effective income of the taxpayers determined by the books kept by the latter. Finally, agricultural delegates recommended the abandonment of a policy of financing new State expenditures by new taxes on agricultural products.

▼Haiti Agricultural Expansion Program

SHADA (the abbreviated name of the Société Haitiano-Américaine de Développement Agricole) is extending its holdings, as part of a program of expanded sisal production. Title has already been acquired to the lands, buildings, and equipment formerly held by the Haitian Pineapple Co. and the Société des Plantations de Saint Marc; "only formalities" are reported to remain before the property of the Cap-Haitian Division of the National Railroad Co. of Haiti is also acquired.

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AGRICULTURE IN THE AMERICAS — MADALINE W. NICHOLS, EDITOR

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Henry Pittier

OUR MUTUAL FRIEND

Dr. Henry Pittier is an outstanding member of that distinguished company of scientists who, since the beginning of American history, have quite possibly been among America's best "Mutual Friends." Born in Switzerland in 1857, Dr. Pittier was educated in that country and served on the Faculty of Science in the University of Lausanne. In 1887 he came to Costa Rica at the invitation of the Ministry of Public Education and began scientific explorations of such great value in the development of the country that today he is regarded with the affectionate esteem of the Costa Rican nation.

Through Dr. Pittier's efforts there was established in Costa Rica a National Institute of Physical Geography, comprising a Meteorological Observatory, Geographic Service, National Museum, and National Herbarium. During seventeen years of work in Costa Rica, Dr. Pittier conducted personal research on the national climatology, botany, geography, geology, fauna, ethnography, and linguistics. The work for which he is best known in Costa Rica is a study of the common plants of the country.

In 1902 Dr. Pittier retired from the service of the Costa Rican government. After a brief period as technical assistant to an American company interested in the development of banana cultivation in Central America, he was called to a position in the United States Department of Agriculture, where he remained until his resignation in 1919. In 1906 he was naturalized as citizen of the United States.

The work at the Department of Agriculture sent Dr. Pittier to many Latin American countries: to Mexico, where he studied the influence of arid areas on agriculture; to Colombia, where he made important scientific expeditions and was in charge of experimental agricultural development, investigating the native varieties of avocados, cotton, corn, and other economic plants; to Panama, where he undertook botanical expeditions; to Guatemala, where he investigated the work of Kelep against the boll weevil; to Venezuela, where he established a National Agricultural School, made a collection of the flora and fauna of the country, and wrote several studies on Venezuelan geography.

Since 1920, Dr. Pittier has been living in Venezuela. Placed in charge of a government bureau created for the study of the natural resources and products of Venezuela, he also reorganized and directed the Venezuelan Observatory and reorganized the Botanical Service. Now, when Venezuela is demonstrating her affection and esteem for her adopted scientist by celebrating his eighty-fifth birthday, as well as the fiftieth anniversary of his arrival in America and the completion of the period of twenty-five years of his residence in Venezuela, Dr. Henry Pittier is demonstrating the constancy of his personal devotion to science. He is at work on a study of the flora of Venezuela, to supplement and perfect his own earlier studies on the subject.

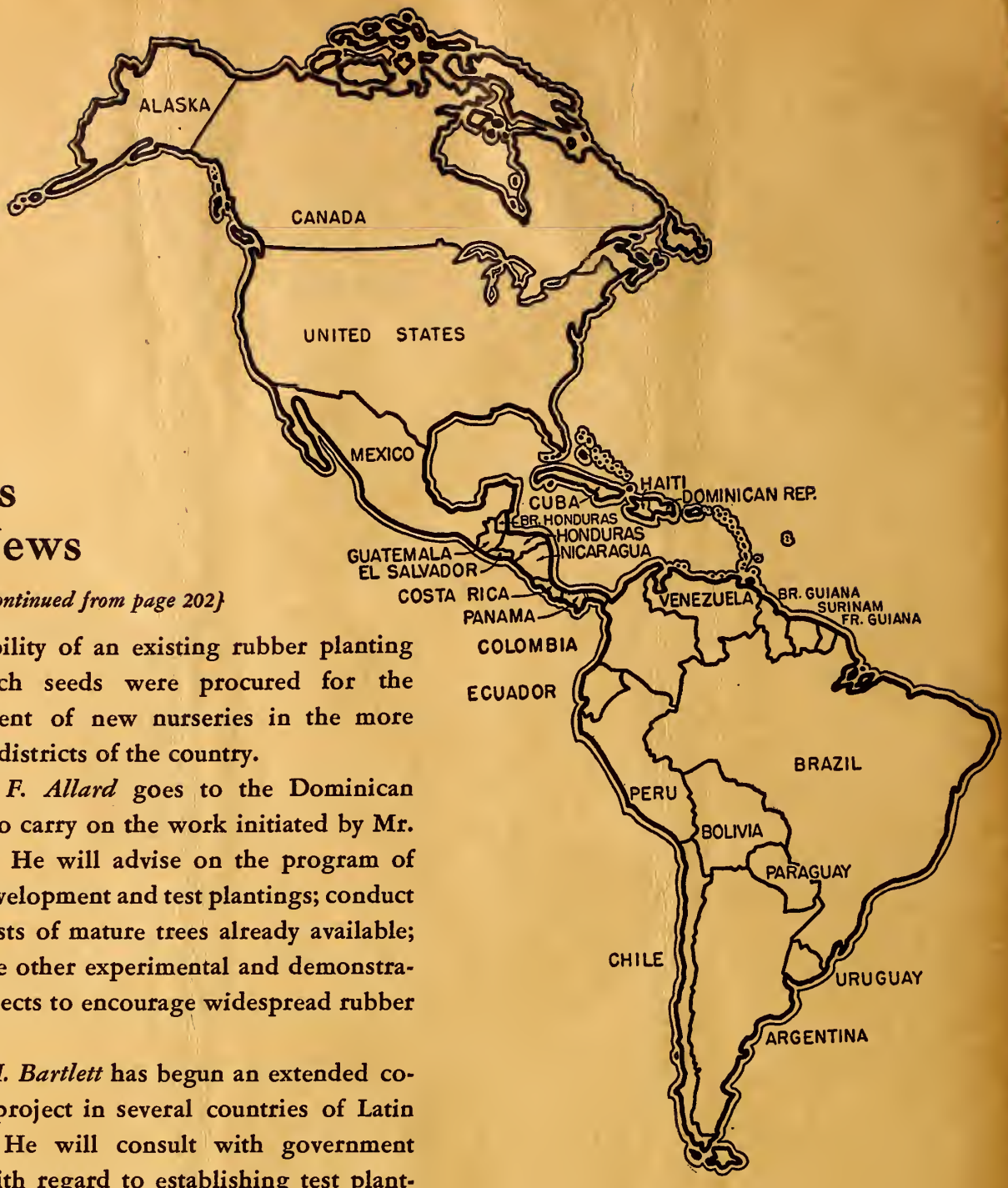
Names and News

{Continued from page 202}

the availability of an existing rubber planting from which seeds were procured for the establishment of new nurseries in the more important districts of the country.

Howard F. Allard goes to the Dominican Republic to carry on the work initiated by Mr. Sorensen. He will advise on the program of nursery development and test plantings; conduct tapping tests of mature trees already available; and initiate other experimental and demonstrational projects to encourage widespread rubber planting.

Harley H. Bartlett has begun an extended cooperative project in several countries of Latin America. He will consult with government officials with regard to establishing test plantings of rubber-yielding plants, especially guayule and kok-saghyz, and establish such plantings, and for this purpose he will transport propagation materials from California or elsewhere. In consultation with representatives of the United States Department of State and officials of foreign governments, Mr. Bartlett will draw up and recommend memoranda of understanding covering research on and planting of rubber yielding plants.



This project deals with the subsidiary rubber plants (*i.e.,* those other than Hevea) which may be grown outside the Tropics to which Hevea is confined, or which may be grown in arid or semi-arid regions, whereas Hevea is confined to regions with a high rainfall.

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Agriculture in the Americas

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UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

December 1942

NAMES & NEWS

Agricultural Missions

In furtherance of the program of production of strategic and complementary crops and the formulation of a long-time agricultural program conducive to Hemispheric economic stability and good will, *Dr. Ross E. Moore,* Assistant Director in charge of Latin American Relations in the Office of Foreign Agricultural Relations, went to South America in October to confer and advise in the organization of the cooperative experiment stations in Ecuador and Peru; to confer with officials regarding the organization and establishment of the Instituto Agronómico do Norte in Brazil; and to continue negotiations and, if possible, complete an agreement for the establishment of a cooperative experiment station in Colombia.

A survey group has begun studies of cinchona resources in Colombia. Chief of the expedition is *Clark Byse;* Administrative Assistant, *Charles Margolis.* The other members of the party are *L. R. Holdridge,* forester-botanist and chief of the field work; *W. R. Silcocks* and *D. W. Winters,* foresters; *F. R. Fosberg* and *C. W. Steere,* botanists; and *Thomas Bellis,* chemist. They will survey two areas where quinine is known to exist in quantity, to determine its amount, quality, and accessibility and to arrange to have it collected and processed by a Colombian company. The group expects to be gone some three months.

Dr. Elmer W. Brandes, Head Pathologist in Charge of Special Rubber Investigations in the Bureau of Plant Industry, left Washington on October 26 for Mexico and Central and South American countries. The primary purpose of his trip is to confer with the Ministries of Agriculture of cooperating countries on the next important step in the hevea rubber program. Dr. Brandes will conclude supplementary agreements covering the establishment of demonstrational plantings in strategic locations, to serve as centers of education and for the distribution of superior planting materials. The principal countries visited on the present trip will be Mexico, Nicaragua, Costa Rica, Colombia, Peru, and Brazil.

In Mexico Dr. Brandes is conferring with local officials and with employees of the United States Department of Agriculture on the recently inaugurated emergency program for rubber production from cryptostegia. Cooperative investigational headquarters are being established in the northeastern Mexican State of Tamaulipas. A supplementary agreement covering hevea demonstrational plantings in the southern part of the Republic was concluded with Mexico at the time of the recent Inter-American Conference of Agriculture.

Dr. Carl C. Taylor of the Farm Population and Rural Welfare Division of the Bureau of Agricultural Economics, has been appointed Rural Sociologist at the United States Embassy in Buenos Aires, in the auxiliary service of the Department of State. Similar appointments in Mexico City and Rio de Janeiro are held by *Nathan L. Whetten* and *T. Lynn Smith.*

Mexican Visitors

Five Mexican agricultural technicians have arrived in New Mexico where they will be stationed for a year's training under the supervision of the Soil Conservation Service. The

{Continued on page 240}

Agriculture IN THE *Americas*

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The New Inter-American Institute

Costa Rica becomes the center for the scientific work of the Americas on tropical agricultural problems. This location is in a typical area for such studies, and it is also most accessible to the scientists of the various countries.

Dr. Earl N. Bressman.

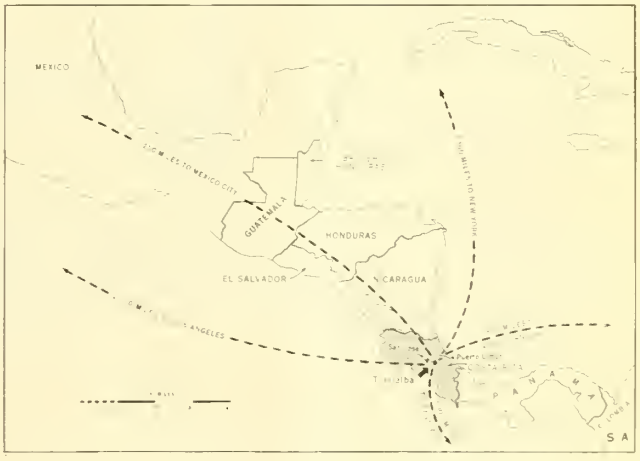
The Inter-American Institute of Agricultural Sciences is to be in Costa Rica, and its director will be Dr. Earl N. Bressman, former Department of Agriculture staff member. That was the important news that came on October 7 from a meeting of the Governing Board of the Pan American Union. The Board had previously set up a charter and bylaws for a corporation to conduct the long-planned Institute.

The site selected is Turrialba, a town in the interior of Costa Rica, 50 miles from San José, the national capital, and about 75 miles from Puerto Limón, the principal port. The town is on the main railroad between the two cities and on the route of the highway which will soon be completed to connect them.

The tract chosen for the main buildings and campus of the Institute consists of 1,235 acres on the outskirts of Turrialba. Most of it is on a tableland overlooking the Reventazón River, at an elevation of about 2,000 feet. Mountains and hills surround the central location, and the inactive Turrialba volcano is less than 10 miles away. Toward the east coast are extensive wet lowland areas. The soils of the region are volcanic, temperatures average in the middle 70's, rainfall amounts to around 110 inches a year, and the humidity is high.

The Department of Agriculture committee which surveyed the site reported the central property near Turrialba as suitable for experimental cultivation of practically all tropical crops, for experimental work on livestock and dairying under tropical conditions, for study of tropical reforestation and erosion control problems, and for investigation of drainage practices. Nearby areas, the committee found, are well suited for the development of tropical crops not adapted to the lowlands. The group was particularly impressed by the opportunity for study of rubber culture, since the site adjoins the United States Department of Agriculture's Costa Rican Rubber Experiment Station and is only about 35 miles by railroad from the extensive Goodyear plantations at Cairo.

Summarizing, the survey party said: "Turrialba offers within a distance of less than two hours by car or train an almost complete cross-section of tropical American conditions. Furthermore, without being actually on the seacoast in an unhealthy climate, it represents the wet lowland regions that are so extensive in tropical America. To a large degree the future develop-



Location of the New Institute.

ment of tropical American agriculture depends upon the solution of the problems of these wet lowland areas . . ."

The Institute is to be managed by a corporation, directors of which will be the members of the Pan American Union Governing Board, which consists of the United States Secretary of State and the diplomatic representatives in Washington of all the Latin American republics. Projects will be recommended by a technical advisory committee composed of a member from each of the countries participating. At the outset, the organization will be financed largely by the United States, but it is expected that the other countries will join in the financing later under a convention to be signed.

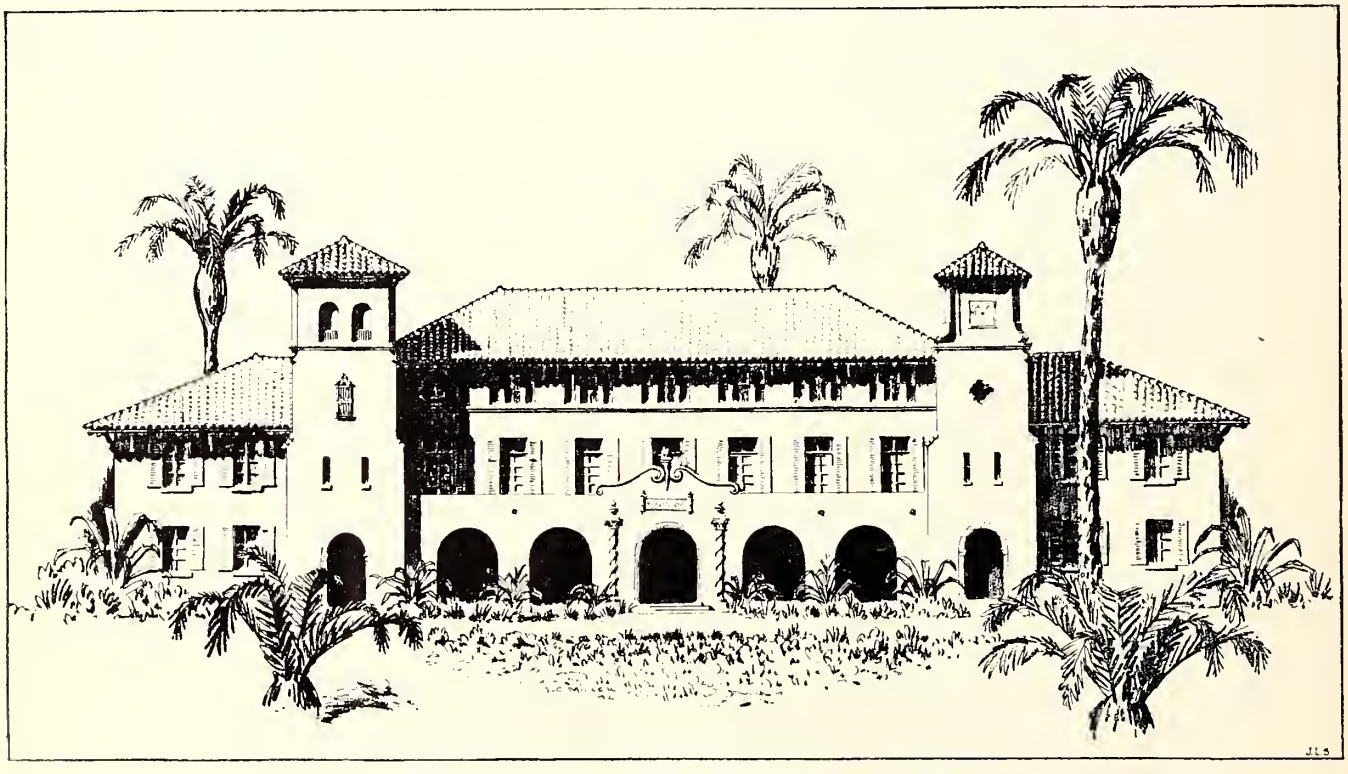
Need for Research

Creation of an Inter-American agricultural research institution has long been regarded as essential to development of tropical agriculture in the Western Hemisphere. The present project was first announced by Vice President Henry A. Wallace, who as Secretary of Agriculture proposed such an Institute to the Eighth American Scientific Congress in Washington in May 1940. The Congress endorsed the proposal in a formal resolution, and the President's Interdepartmental Committee on Cooperation with the American Republics approved it. So did the Advisory Committee on Inter-American Cooperation in Agricultural Education. Later in the year the Pan American Union appointed an Inter-American Committee on Tropical Agriculture to make preliminary plans.

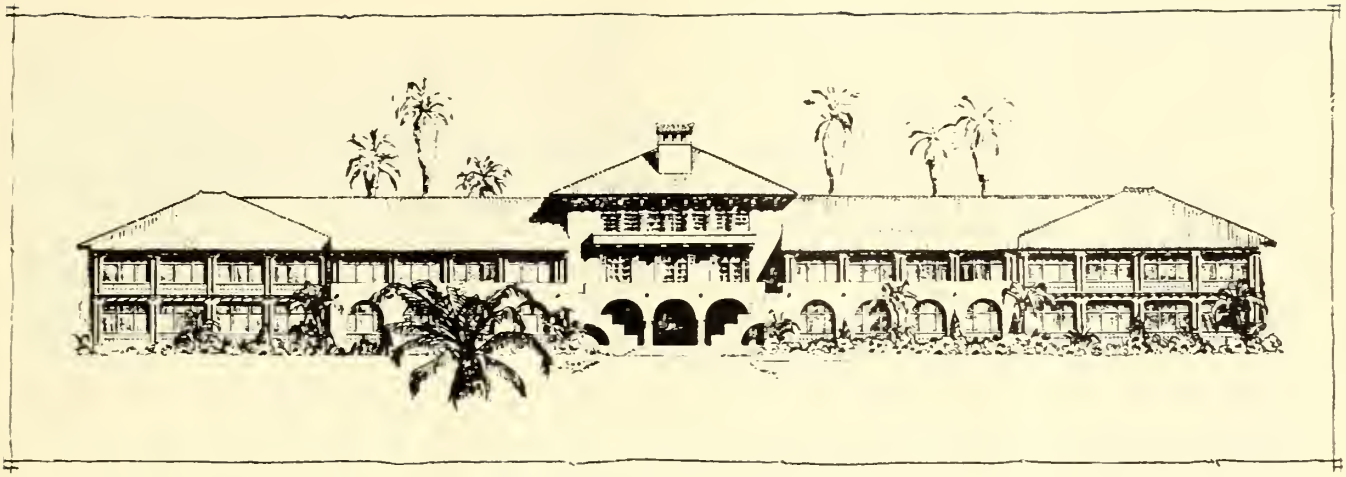
Sites were offered by the Republics of Bolivia, Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, and Venezuela. At the request of the planning committee, a technical party from the Department of Agriculture undertook a survey of all sites offered, appraising them for international and local accessibility, health conditions, and suitability for tropical agricultural research.

Meanwhile, other plans went forward. Buildings were designed by Department of Agriculture architects. Consideration was given to various possible methods of organization and financing. Agreement was sought among the various republics as to the Institute's function and program. Results and recommendations growing out of all these activities were approved by the Inter-American Committee on Tropical Agriculture in June, and the decision was ratified by the Governing Board at its October meeting.

The Institute is conceived as a combination school of agriculture and agricultural research center, the facilities of which will be used by all of the American republics. Its objectives, as generally agreed upon by agricultural leaders of the Hemisphere, are: to provide a place for research on tropical agriculture under favorable conditions; to furnish facilities for training scientific personnel grounded in tropical agricultural problems; to develop



Proposed Administration Building for the Institute.



Design for the Dormitory Building.

mutual understanding among agricultural students of the Americas; to serve as a center for cooperative research projects; and to strengthen cultural relations among the American republics.

Furthermore, the Institute will have real significance in the present emergency, as Dr. Bressman pointed out in a paper prepared for the Mexico City agricultural conference.

"Immediately on becoming organized," he said, "the Institute will be expected to furnish advice and assistance on problems created by the emergency. In cases where applied research is required, the Institute can take the responsibility for getting it done. In addition, through its coordinating activities, it can help in the activities of the various agencies doing experimental work on problems created by war conditions. In other words, it is to be not an academic organization but an institute of applied research."

Institute Plans

Plans for the Institute contemplate utilization of research facilities offered by the governments of several Latin American republics as well as those of Costa Rica. Among the organizations whose facilities have been offered are the experiment stations of Puerta de Díaz (in Salta) and Loreto (in Misiones), Argentina, situated in the subtropical region of the country; the station located at Chulumani near La Paz, and the farms of Trinidad and of Palermo in Santa Cruz, Bolivia; the Agronomical Institute in Belém, State of Pará, Brazil; the experiment station at Palmira, Colombia; the experimental fields situated in the region between the capital and Santa Ana in the large region of Tapachula, State of Chiapas, Mexico; the experiment station at Tingo María, Peru; the Agricultural Experiment Station at Santiago de las Vegas, near Havana, Cuba; and the Institute of Tropical Agriculture at Mayagüez, Puerto Rico. It is hoped that similar arrangements will be made with other governments for collaborating in the work of the Institute.

The New Director

Until this appointment the Institute Director, Dr. Bressman, was in charge of the Agricultural Division of the Office of the Coordinator of Inter-American Affairs. Previously he had taught in the state agricultural colleges of Iowa, New Mexico, Montana, and Oregon and had been with the Department of Agriculture as Scientific Adviser to the Secretary and Assistant Director of the Office of Foreign Agricultural Relations. He is a native of Nebraska, holds degrees from Iowa State College and the University of Nebraska, and has written a number of books on phases of agricultural production. He has been in most of the countries of Latin America on agricultural missions. Dr. Bressman expects to operate from Washington with a small administrative staff, while Mr. Robert A. Nichols will be the agriculturist in charge of field operations and will leave for Costa Rica shortly to study the sites, arrange for distribution of buildings, and consider facilities for water supply, electricity, and drainage.

Other Officials

Secretary of the organization will be José L. Colom, Chief of the Division of Agricultural Cooperation of the Pan American Union. He will remain in Washington, combining the duties of the two positions. Rex A. Pixley, who resided in Haiti for many years, will be Business Manager of the Institute.

The Brazils

It takes superlatives to describe a land of such tremendous potentialities as Brazil. Traditional collaborators in peace as well as in war, this great nation and the United States now move toward ever closer friendship and greater mutual service.

by PHILIP LEONARD GREEN

Politically, Brazil is a single great country. Economically and geographically, there are many Brazils, each vast in size, each with its own peculiar characteristics, and each tremendously significant.

Among these Brazils is the "Amazon region," with the world's largest unexplored jungle area and unpredictable economic potentialities for the future. The Amazon River system covers and drains the entire northwestern part of Brazil, as well as parts of some of the neighboring countries. This region is almost a world in itself. Though sparsely populated now, there is no telling what may result if man wins his continued struggle against climate and disease. Some writers predict that the Amazon region may become a future haven for many of the dispossessed and ambitious of the world and that it may well repeat in this century the history of the great western regions of the United States in the last.

Another "Brazil" is the "Atlantic bulge," so important in the defense of the American hemisphere, with Natal as the jumping off point for Transatlantic planes.

Again, there is Minas Gerais, a land rich in minerals and precious stones.

In the cooler region of the country's southland, there is the industrial section of Brazil, with the modern and progressive city of São Paulo as its center. Here industrial development, already on the increase, has been markedly stimulated by the present war.

Still farther south, is the cattle country centered in the State of Rio Grande do Sul.

Last but not least, there is Rio de Janeiro itself—capital of all the Brazils and a perfect example of natural beauty and man's handiwork skillfully combined. Rio's harbor is acclaimed by many the most beautiful in the world.

Even a casual student or observer of the Brazilian scene feels a need for superlatives in describing almost everything connected with the country. It is the largest American republic. With its 3,275,510 square miles, it is larger than the United States and even has room to spare for an additional state of the size of Texas. It is the fourth largest country in the world. It occupies about half of the entire area of the South American continent. With 45,000,000 inhabitants—the largest population of any Latin-American country and about half of South America's total population—Brazil is a force in the modern world.

Courtesy of Moore-McCormack Lines.

Copacabana Beach of Beautiful Rio de Janeiro.

Citrus Grove at the Experiment Station of the College of Agriculture, Minas Gerais, Brazil.

Like several other American countries, Brazil has been a magnet for people of almost every race. Unlike those of other South American countries, the original European settlers of Brazil were not Spaniards, but Portuguese. Today Brazil speaks Portuguese; her culture is Portuguese in origin.

Italian immigrants have played a notable part in Brazil's development. There are in Brazil about 3,000,000 people of Italian extraction, concentrated for the most part in the São Paulo region. Italians have readily merged with the rest of the population and have not constituted a grave political problem.

Japanese immigrants number around 200,000 and are concentrated in small, isolated communities both along the Amazon and in the state of São Paulo. Though these Japanese have no effect on the social, cultural, or political life of Brazil, the fact that they tended to perpetuate Japanese language and customs through schools conducted in Japanese gave the Brazilian Government considerable concern for a long time. A few years ago a law was passed requiring all schools in Brazil to conduct their teaching in Portuguese.

The German element, found mainly in the southern states of Brazil, is another strong factor in the population picture. There are about 830,000 Germans in Brazil but, in addition, around 1,400,000 people may be said to have German forbears. Up to the entrance of Brazil in the war, the Germans were reputedly spending about $2,500,000 a month on propaganda in Brazil. While most of the older immigrants and their descendants were patriotic Brazilians, many of the relatively new arrivals were partisans of the Third Reich.

Immigrants from the United States have been relatively few. There were some "unreconstructed" Southerners who went to Brazil after the war between the States. Their descendants—full-fledged Brazilians though bearing typical Dixie names—may still be seen in Santarém and at Villa Americana, near São Paulo.

Brazil's people are fairly well scattered throughout the southern part of the country, but the northern or tropical region is thinly settled. Of the States of Brazil, Minas Gerais is the most populous, with its 8,000,000 citizens.

A land so vast and so sparsely populated, obviously is destined for an era of great expansion, comparable to—and in many ways surpassing—that which took place in the United States during the last century. Of course, such expansion would call for considerable advance in drought control in certain sections, in public health programs throughout the entire country, and in the reclamation of some sections located near centers of civilization. Along all these fronts the Brazilian Government is making a determined advance. The draining of the Fluminense marshes near Rio is a case in point. On the land thus made livable, about 2,000,000 people could be accommodated.

Particular interest has been accorded within recent years to the Amazon region, an area larger than that part of the United States which is east of the Rocky Mountains. President Vargas personally visited the region about two years ago. He pointed to the tremendous potentialities of the region, not only in terms of the products required for hemispheric defense but also for subsistence crops. The northern States of Amazonas and Pará, for example, import about 90 percent of their food requirements from southern Brazil. The State of Rio Grande do Norte ordinarily imports about 50 percent of its food needs, and in times of drought, about 75 percent. Though self-sufficient in many items, Pernambuco brings in potatoes and beans from the south. Pará imports onions, flour, fresh vegetables, and jerked beef from the same source, and rice from Sergipe. Sparse population, tropical diseases, and lack of communications are some of the reasons why the northern part of Brazil is not self-sufficient. Cooperative efforts by Brazil and the United States are now under way to solve these problems. The Brazilian Government also points with pride to the young Agricultural Institute of the North, at Belém.

Though the country is gradually changing to an industrial economy, it is today still mainly agricultural. Coffee, cotton, cacao, and sugar are its most important crops. Almost 70 percent of the world's coffee supply comes from the São Paulo region of Brazil. So much of

Courtesy of the National Coffee Department, Brazil.

Workers' Homes on a Coffee Plantation at Itaquere.

it is grown that normally Brazil has to burn about 15 percent of each crop. A new coffee plastics industry may serve to solve this problem. Since the outbreak of the war, other agricultural products have gained in importance. Rubber growing, for instance, is undergoing expansion. The war situation has also aroused interest in such products of the northern regions as oil-bearing nuts, fibers, and insecticidal plants.

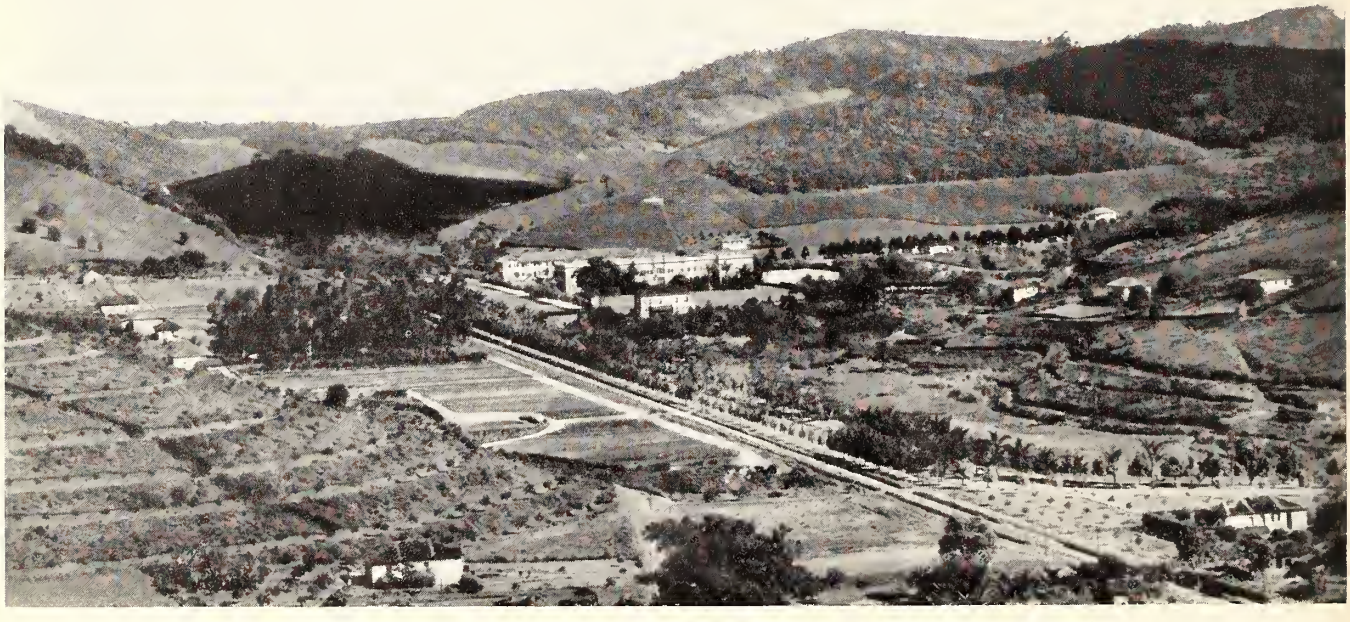
Brazil has directed considerable effort toward diversifying agriculture and strengthening the position of the farmer. Farm cooperatives, for instance, increased from 57 in 1930 to 1,075 in 1940. The Brazilian rural service under the Department of Agriculture, addresses itself to such problems as rural social welfare, soil analysis, production, transportation, prices for farm products, standardization of quality, and government aid for buying farm machinery.

Industrially, Brazil has been forging ahead at the impressive rate of an increase of some 148 percent in the last ten years. Textile-making leads her industries, but she manufactures many other things. Among these are beverages, perfumes, drugs, meat products, oil, furniture, shoes and other leather goods, hats, paint, ink, paper, electric appliances, toys, glass, and even airplanes. In São Paulo, Brazil's chief industrial center, there are over 8,000 factories. About two years ago, the United States Export-Import Bank allotted a credit of $25,000,000 to help finance a large iron and steel mill. A United States-Brazilian technical commission in Brazil has been working to convert Brazilian factories to war production.

In normal times, Brazil purchases machinery, tools, industrial equipment, automobiles, trucks and parts for them, drugs, textiles, oil, coal, radios, sewing machines, rails, office equipment, books, maps, pictures, and a variety of food products.

A reciprocal trade agreement with the United States has been in force since January 1, 1936. In addition, Brazil has signed agreements on lend-lease; on the development of rubber, babassú and timbó; and on collaboration in hemispheric defense. For some time before her historic entrance in the present world conflict as an ally of the United States—in which she repeated her action during World War I—Brazil had already been working very closely with this country.

Culturally, too, Brazil has made remarkable progress. Realizing the value of popular education, she has increased the number of her secondary-school students from 60,000 in 1930 to 300,000 in 1940. She maintains close relations with the United States in the cultural as well as in the economic field. Be it said to the credit of both countries that this is not simply a war-born amity. Brazil has always been friendly with the United States, and the feeling has been freely reciprocated. One of Rio's most important public buildings is named the Monroe Palace, and Brazil was among the first countries openly to welcome the declaration which bears that name. Neither is there any doubt that the present cooperation, though quickened by war needs and dangers, will be abandoned when the two nations again find themselves at peace. Both Brazil and the United States, traditional collaborators in peace as well as in war, bid fair to march together in the future, as they have in the past, toward ever closer friendship and mutual service.



College of Agriculture Experimental Station. State of Minas Gerais, Brazil.

Cattle for the Tropics

The problem of the animal breeder is to develop in heat-tolerant breeds greater specialization in meat or milk production without materially reducing their superior adaptability to their environment.

by A. O. RHOAD

With the exception of the llama and its cousin the alpaca of the high Andes and the turkey of our barnyards all the species of livestock in the Americas are introductions. These introductions from across the seas have been going on from colonial times to the present. Some species and breeds have prospered in the New World, others have been greatly improved, and a number of new breeds have been developed in the Americas. Before the present war there was a considerable exchange of improved stock between the twenty-one Republics of the Americas.

Over the centuries and unawares, a vast trial-and-error experiment has been going on with these animal introductions, in a search to find that combination of climate, soil, and economic structure where the animals would thrive and serve man best. It is not surprising that many failures have occurred. Breeds from northern climates have been introduced into the humid tropics, large breeds have been placed in regions of scanty vegetation, low-land breeds have been placed in the highlands and vice versa.

Halfbred (Brahman x Aberdeen Angus) Cows with Their Quarterbred (One Quarter Brahman x Three Quarters Angus) Calves. Reared at Jeanerette, La.

Breeding for Climate

Many species and breeds have been tried in almost every major livestock region of the Americas. Experience has taught us which fit best into given localities, and there is now discernible over the Americas a sort of stratification of types and breeds as they have found the areas of greatest usefulness to man. In the northern part of the United States the European breeds have prospered; in the warm southern states the heat-tolerant mule and Jersey cow predominate. In the regions of medium rainfall, cool climate, and good pastures mutton-type sheep prosper; in the drier regions the wool producers predominate. In the semi-arid regions goats thrive. Farther south the crossbred Brahman (zebu) appears, and in the true tropics of Central and South America the purebred and high-grade zebus and "native" cattle are the chief work and meat animals. Farther south into the cooler regions of South America the European types and breeds again are found in large numbers.

It is in the tropical and sub-tropical regions of the Americas that a major dairy and beef cattle improvement problem exists, for the highly specialized European breeds do not thrive in hot climates.

Before improvement of dairy and beef cattle is attempted there are two fundamental points to consider. The first is indicated above: namely, that breeds differ in their ability to thrive in a warm or tropical environment. The second is that the improvement sought should be within the limitations of the environment to support the improved types. The first point emphasizes the necessity that improvement must be within or through the breeds of proven adaptability to a tropical environment. The second emphasizes the necessity of maintaining a balance between the degree of improvement sought and the level of the environment in which the breeds must produce and reproduce.

It is common knowledge that the present breeds of cattle found in tropical regions of the Americas have not been highly selected or improved for milk or meat production. They are, on the other hand, eminently

suited by heredity to withstand the rigors of a tropical environment. From the point of view of the animal breeder the superior qualities of adaptability are as important in improving a breed as high milk production or desirable beef-type conformation.

The hitherto time-consuming, hit-and-miss method of determining adaptability of breeds to tropical environment is disappearing with the development of new scientific methods of determining the fitness of animals to survive in warm climates. At the Iberia Livestock Experiment Farm, Jeanerette, Louisiana, the United States Department of Agriculture is conducting certain physiological and other tests which measure the degree of heat tolerance of cattle. What previously took several generations of cattle to determine, may now be accomplished through these tests in a few weeks. From the tests it has been determined that as the amount of Brahman (zebu) breeding is increased in a strain of cattle, the heat tolerance increases. Cattle with a high proportion of Brahman blood do not suffer because of high atmospheric temperatures. Because such cattle can stand the heat they will graze longer during the day, will keep in better flesh, and will not decrease in milk production because of high atmospheric temperatures. Experiments have shown that breeds or individuals within a breed, that cannot remain comfortable in a tropical environment become distressed, exhausted, and develop a febril condition in their bodies which is harmful to reproductive functions and deleterious to normal growth and production and, if long continued, causes a degeneration of the stock.

Importance of Coat Color

Experiments have also shown that coat color is important. Cattle with the lighter coat colors, as the white of the Brahman or the fawn of the Jersey, throw off a much larger proportion of the intense solar heat than cattle with deep colored or black coats. Short hair and pigmented skin are also important. Short hair permits greater freedom of body heat elimination and offers less protection to cattle ticks. A deeply pigmented skin underneath the hair coat impedes the penetration of strong solar rays which cause skin burn in animals with non-pigmented skins. Breeds native to the tropics, as the Brahman, or such "native" breeds as the Criollo that have, through the centuries, become acclimated to warm climates, possess short hair coats, have pigmented skins, usually are gray or cream-colored, and—most important—are physiologically adjusted to warm climates. All these add up to demonstrated heat tolerance and adaptability to a tropical environment.

The established native breeds and those carrying Brahman (zebu) blood are genetically adjusted to the warm climates, but many are low producers of the products for which they are kept. The problem of the animal breeder is to develop in these breeds greater specialization in meat or milk production without materially reducing their superior adaptability. The amount of heat tolerance to retain or to breed into cattle depends on the severity of the climatic conditions. In the sub-tropical Gulf coast region of the United States one-fourth Brahman and three-fourths European breeding is sufficient. As the climate approaches true tropical conditions a greater proportion of Brahman breeding, or native breeding carrying equivalent heat tolerance, would be necessary to insure satisfactory adjustment to the tropical environment. To have animals genetically adjusted to the tropical environment is a primary prerequisite to any successful cattle-breeding program directed towards increasing production.

Breeding for Beef

With meat animals the problem is not so difficult as with dairy animals, for within certain of the tropical breeds the variation in type is sufficiently wide to permit selection towards the ideal beef type without introduction, through crossbreeding, of beef blood from exotic breeds. That specialized beef type animals, approaching the ideal, can be developed within pure tropical breeds is demonstrated in the improvement made in the zebu in Brazil and in the United States. The Caracú of Brazil and the Blanco-Orejinegro of Colombia are examples of similar improvement through selection within the pure native breeds.

Crossbreeding the native or the Brahman with specialized European beef-type breeds is carried on in many tropical parts of the Americas where the tropical breeds show only limited specialization as beef animals. In other words, these animals are inefficient producers because their inherent capacity to produce is below what the environment can support; specialized exotic breeds are imported to increase the potential level of production in order that the resulting crossbred may be a more efficient animal. In the Gulf coast region of the United States, cattle are bred-up so close to the pure-bred European type that Brahman cattle are used to incorporate heat tolerance into the former. Here the environmental level and the potential level of production are in reverse relationship to the above, for along the Gulf coast inherent capacity to produce is above what the environment can support; consequently growth, production, and reproduction suffer. Exotic tropical breeds are imported to increase heat tolerance in order that the resulting crossbred may be more in harmony with its environment and, therefore, a more efficient animal. Whether the crossbreeding is carried on under the severe environmental conditions of the tropics or under the milder conditions of the Gulf coast, a proper balance

between heat tolerance and beef type must be maintained for the best results. Once the proper adjustment between heat tolerance and beef type is obtained in the crossbreds, progress towards fixing new strains through the systematic application of known genetic principles may be made. In this manner the Santa Gertrudis breed of beef cattle of southeast Texas was evolved.

That more extensive crossbreeding with beef cattle has not been carried on in tropical regions is partly explained by the fact that the beef breeds are also the chief source of work animals. This is an important consideration to the farmer and breeder, for much of the heavy farm work and transportation is done by work oxen. Because of their heat tolerance, the tropical breeds have proved eminently suited to work in the yoke. Crossbred oxen with less heat tolerance have frequently proved undesirable because of their inability to work and remain in reasonably good flesh in a tropical environment.

While the principle of maintaining a balance between the animal's capacity to produce and the environment's capacity to support is equally applicable to dairy cattle, the solution is more difficult because the level of milk production of native tropical cattle is generally low. Development of specialized dairy animals within the native tropical breeds of the Americas is, therefore, not likely to occur. Working with a group of animals whose proved production under the best of feeding and management does not exceed 2,000 pounds, it is quite impossible, genetically, to develop a tropical dairy breed with an average milk production of 5,000 pounds. If the group does not carry the genes for an average production of more than 2,000 pounds, there are no genetic means of increasing production without incorporating genes for high production through crossbreeding with an exotic breed possessing the necessary genes. This fact has been generally recognized throughout tropical America. As a result, recourse to crossbreeding to increase milk production is more generally carried on than crossbreeding to increase beef production.

Crossbred Bull Used at Jeanerette, La., in the Early Stages of the Crossbreeding Program. Produced by Mating Aberdeen Angus Cow with Brahman (Zebu) Bull.

Breeding for Dairy Purposes

With dairy cattle, on the other hand, man frequently lessens the effects of adverse tropical conditions by adjusting the environment through better feeding, especially during periods of drought, and by furnishing some shelter from intense solar radiation. Air-conditioned dairy barns have come into use in some tropical countries. Where the environment has thus been adjusted, a higher proportion of exotic blood from breeds possessing the genes for a high level of milk production may be incorporated in the herd.

Fortunately, crossbreeding the native or the Brahman with the high producing exotic dairy breeds has been carried on for many years in various parts of tropical America. Although frequently the crossbreeding has not been done in a systematic way, there are available at the present time large numbers of crossbred dairy animals. Through the process of several generations of inter-se crossbred matings and the elimination through natural causes of the less adaptable progeny, there are within these large populations many individuals in which the superior qualities of both parental stocks are harmoniously combined. Although they are quite heterozygous and therefore uncertain in their transmitting abilities, they are good basic stock from which new types and breeds may be evolved through the application of known genetic principles.

Where the pure tropical breeds have demonstrated efficient production and where desirable crossbred types are available in considerable numbers, the process of improving or perfecting them for meat or milk production requires only the systematic application of well-established breeding methods that are followed in many of the modern specialized breeds. Where, on the other hand, tropical breeds of demonstrated productive efficiency are lacking and where desirable crossbred types are not available, an important breeding problem exists in determining what foreign specialized breeds should be used in making the original crosses and to what extent the crossbreeding should be carried.

The solution of this important problem is dependent upon a study of the conditions of the environment in which the animals are to be maintained and also of the degree of adaptability of the foundation stock and of the foreign breed to a tropical environment. The initial genetic problem is to develop a type of animal whose level of production and adaptability are in harmony with the level of the environment.

The Basis of Inter-American Collaboration

by ROSS E. MOORE *

Through many of its agencies working under the general supervision of the Interdepartmental Committee on Cooperation with the Other American Republics, the United States Government is developing a broad program of Inter-American cooperation. Because of the present emergency, much of that program is agricultural in content.

The purposes which have determined the interdepartmental program are: (1) to encourage exchange of those things which each nation has in abundance for the things which each other nation produces beyond its own needs; (2) to lay the foundations of enduring cooperative effort as well as to satisfy the needs of the present emergency; and (3) to make certain that the projects undertaken will redound to the benefit of *all* the people in each country.

The program is formulated on a few basic principles. It stems from the needs of the people whom it is to serve; it recognizes the fundamental right of these people to shape their destiny by applying their own ingenuity and labor to their own resources in order to improve the common welfare, while we serve as teachers and advisors until such time as they feel competent to assume full administration. While the exigency of the times may demand emphasis on the production of certain strategic commodities, a condition recognized by the cooperating republics, the long-time plan is aimed at improving and increasing the production of a wider variety of subsistence crops and salable agricultural products which complement those of the United States, thus increasing the productive capacity of the people, raising their levels of living, stimulating both domestic and international trade, and generally promoting those activities which lead to friendly cultural and commercial relationships.

It is recognized that our efforts must be adapted to the environment, taking due account of the geological, biological, and ethnological conditions; that our chief contribution will be scientific principles; that we cannot expect to transplant our institutions as such. We approach the job with an open mind, a sincere effort to be helpful in the broadest application of the term, and with considerable humility, for we realize that our efforts are puny as compared to the need and that truly measurable results may be slow in coming.

It is within this broad program and against a background of ancient diverse and changing cultures that we set the program of the Department of Agriculture. The Division of Latin American Agriculture coordinates the program of the Department. This program has to do with the establishment of cooperative agricultural experiment stations, the inauguration of extension education, and the training of citizens of the several republics for eventually assuming leadership in both research and extension work.

Establishment of Experiment Stations

The experiment stations and extension education which are integrated under one director are established under cooperative agreements between the Department of Agriculture and the other Republics. Provision for such stations has been made in El Salvador, Ecuador, Nicaragua, and Peru; negotiations for others are in progress.

Of basic importance in the making of a station is the caliber of its staff members and their successors. A full realization of this truth has led us to choose with extreme care the technicians whom the Department sends to the stations and to make provision for the preparation of a corps of trained workers to succeed them.

The personnel training program has two distinct aspects. At each station, at least half of the research staff and perhaps ninety percent of the extension education staff will be composed of nationals of the country in which the station is located. Their training at the station will enable them to assume responsibility for the local program.

The second aspect of the training program involves advanced instruction in the United States of students from the other American republics.

Insofar as cooperative agricultural programs in the Americas are concerned, their success will to a large extent be measured by the degree to which they serve to rationalize agricultural production in the western hemisphere with the concomitant commerce in agricultural commodities and to lay the foundation for a better fed, better clothed, and better housed society on a hemisphere-wide basis.

*From an address by Dr. Moore before the Association of Land Grant Colleges, at Chicago, October 28.

Indian Farming in South America

Its main need is the increased production which will raise the consumption standard of the Indians and provide a greater food supply for the nations. Indian agriculture is almost entirely synonymous with small scale commercial agriculture.

A Peruvian "Man with the Hoe."

by ERNEST E. MAES

Both in the United States and in Latin America, thoughtful students of the agricultural situation are becoming ever more aware of the need for developing national programs to improve the agriculture of that very large segment of the farming population which produces, not for the requirements of national or international markets but for the needs of its own subsistence. In the United States that awareness is best illustrated by a quotation from the extremely thought-provoking Year-book of Agriculture for 1940, entitled "Farmers in a Changing World." In that book is the following statement:

"Hitherto the problems of commercial farmers have almost completely dominated agricultural thinking and policy. These problems still bulk very large, as they should, but they no longer tell the whole story. In the last few years Americans have become aware of a rather startling fact: A third to a half of the farm families in the United States contribute little to our commercial supply of food and raw materials. They have little to sell; they are unable to compete in the commercial market; they live for the most part in great poverty: many of them are homeless migrants. They seem to have little economic function."

This statement is also applicable to Latin America: the problem it states is the major national problem of virtually every country. Although between 70 and 90 percent of the farmers in most countries may be classified as essentially noncommercial, it has not been possible to develop adequate agricultural programs to improve the agriculture of this large majority. In every country agricultural officials are giving a great deal of thought to the problem of developing such programs to encompass the needs of all the rural population, and it is possible that the present world situation will accelerate such a development.

In several Latin American countries an overwhelming percentage of the noncommercial farmers are Indians. A brief consideration of the situation of these Indian farmers may serve to indicate some aspects of the problem of the noncommercial farmer in South America—the problem that an increasing number of Latin American agricultural leaders feel must be solved if the continent's economy is to be truly sound.

Venezuelan Farming

In Venezuela most of the Indian population has merged into the general population of the country and does not retain its identity as a separate group in the nation. Besides the unacculturated Indians, however, there are a few Carib tribes in the eastern llanos who maintain their traditions and their identity as Indians. These people cultivate small patches of land along the rivers that drain the llanos. They plant corn, sweet and bitter manioc, and a little fruit. The agriculture is meager in the extreme, and because of the periodic

Plowing a Potato Field Near Warisata, Bolivia. The Decorative Flags on the Oxen Indicate the First Day of Spring Plowing.

Stony Indian Fields Above La Paz, Bolivia.

droughts, floods, and insect pests it furnishes a very uncertain sort of livelihood. The agricultural production is supplemented by a considerable amount of fishing in the many streams. The Caribs use barbasco root, a source of rotenone, for poisoning the fish. It appears that the agriculture, not only of the Indians but of the other peoples who live in the llanos, could be considerably amplified, and this is especially necessary today because the problem of food supply is becoming increasingly serious throughout the area.

At the other end of Venezuela, in the highland areas that extend to the Colombian border, there are many small farmers who no longer retain their identity as Indians, but who retain many Indian racial and cultural characteristics. Their agriculture is a typical mountain type, with the cultivation of corn and wheat assuming an increasing importance in the higher portions of the area. In this area there is a surplus of farming population in terms of the land actually used, and consequently there is a serious economic problem. The lack of land forces many small farmers to farm steep slopes in such a way that the topsoil is washed away in two or three years and constitutes a serious conservation problem. At the present time most of the agriculture of this area is of the noncommercial variety, and there is practically no surplus for the markets of the country. Virtually all of Venezuela's agriculture hardly produces enough to supply the needs of the farmers themselves, to say nothing of furnishing a food supply to the industrialized oil-field workers of the nation.

In Colombia

As in Venezuela, a large number of the Indian population of Colombia has merged into the general population and does not retain its identity as Indian. All through the highland areas of the country, however, there are many communities that retain Indian racial and cultural characteristics. The farmers here practice a temperate zone, high-altitude type of agriculture that satisfies only the food needs of the farmers themselves. In the past the highland people of Colombia did not migrate in large numbers into such warm, tropical valleys as the Cauca because of the prevalence of malaria and because of the ownership pattern of the land. It appears today that there is a surplus of population throughout the highland areas in relation to the agricultural land. At the same time there are tremendous areas where extensive new lands could be utilized to advantage by the surplus highland population if a means could be found to make available to them the fertile lowland valleys. According to some thoughtful agricultural officials, this maladjustment is a fundamental problem of Colombia.

Southern Colombia, from the city of Pasto to the Ecuadorian border, is noticeably different from the rest of the country. This difference is traceable to the fact that this area is definitely Indian, and it is similar to the highland areas of Ecuador, Peru, and Bolivia, the three countries with a majority of Indian population.

Ecuador's Three Zones

Ecuador is easily divisible into three distinct geographical areas: the *Litoral* or Pacific coastal area, the *Oriente* or eastern jungle portion, located in the western end of the Amazon watershed, and the *Sierra* or inter-Andine region. The latter is the area of ancient Indian settlement. It is the most densely populated of the three areas by far and represents the heart of the Indian problem of Ecuador. The estimate is that the total population of this area is 2,100,000 and that the density of population is over 30 per square kilometer. The rural population of about 1,600,000 contains an estimated 80 and 90 percent of the pure Indian population of the country. The agriculture of this area is practically all a temperate zone type, with cereals and potatoes the most important crops.

Indians Working on Hacienda Field Near Santiago de Huata, Bolivia.

Approximately one half of the rural Indian population of the *Sierra*, or about 800,000 people, have the right to use land either individually or in community. The rest of the population supplies the agricultural labor of the *hacienda*. The hacienda Indians are given a plot of land, called the *huasipungo*, which they may cultivate for themselves; in exchange they contribute several days of labor each week to the owner of the hacienda. This system is universal in the *Sierra*, except where the Indians own the land either individually or in community. The area produces a relatively small agricultural surplus, and virtually all of Ecuador's exports come from the haciendas of the western lowlands.

Agricultural production in the *Sierra* has not proven very profitable even to the owners of many of the estates. Finding themselves in a difficult economic situation because of the cacao crop failures about the coast and because of the collapse of the world market for some of their products, some hacienda owners decided to sell a part of their *Sierra* land holdings. As it was found impossible to sell these intact, the owners divided them into small lots and sold them to the ever land-hungry Indians. The Indians could purchase them because they were always able to obtain wage work in the rice and sugar cane plantations of the coast, where they received a sufficiently high wage to permit them to save enough to pay for the land in a few years. This interesting social phenomenon has been going on for several years, especially in the provinces of Loja and Tunguragua.

It has been very interesting to some of the personnel of the Ministry of Agriculture in Ecuador to notice that as soon as the Indians acquire their own land, their production increases tremendously. Lands that were formerly producing hardly enough for the taxes are in many instances supporting large groups of families today. A fundamental feature in the problem of the small Indian farmer in South America is the fact that Indians are very often not especially productive when working as peons on the large landed estates, but upon acquiring their own land they will expend tremendous care and energy on it, and their productive capacity increases accordingly. One of the most prosperous areas in Ecuador is in the province of Imbabura, where the Otavalo Indians have owned their lands for centuries and have demonstrated the capacity for the material progress inherent in Indian communities when they have an adequate land base to their economy.

The Ministry of Agriculture in Ecuador is now considering the possibility of initiating soil conservation work among some of the Indian communities. According to the Director General of Agriculture, it will be the first time that any program of that Ministry has had its primary incidence upon the Indian farmer.

As in the case of Ecuador, Peru may be easily divided into three geographic areas, namely the *Sierra*, the *Montaña* (which corresponds to the *Oriente* of Ecuador), and the *Litoral*. The agriculture of the *Litoral* is concentrated in the valleys of the few rivers that cross the coastal desert to the sea. Here are large-scale farming operations with tremendous capital investment in the form of irrigation systems. This area produces virtually all of Peru's agricultural exports—namely, cotton, rice, sugar, and linen. The Indians of the coast have merged into the general population and form a sort of rural proletariat that depends for its living upon wage work in the haciendas.

As in Ecuador, the population that retains its identity as Indian is concentrated in the *Sierra* region. In the *Sierra* there is a relative surplus of population in terms of

La Pauta, a Model Indian Community near Jauja, Peru.

the cultivated land, and practically all the crop production is consumed locally by the farmer himself. It is interesting in this connection that virtually all the cash income of *Sierra* agriculture is derived from the sale of livestock and that most of this commercial income goes to the large land owners, while practically all of the crop production—usually potatoes, corn, and barley—is consumed in the *Sierra*. The agriculture of the area undergoes a progressive decline from north to south, and this decline is attributable to the increase in altitude which varies from approximately 7,000 feet in the north to nearly 13,000 in the region of Lake Titicaca. In the northern end of the country the Indian farmer produces beans, corn, potatoes, and occasionally fruit. In the south there is an almost complete concentration upon potatoes and barley, with a little production of the native grain, *quinua*. In the higher areas of the south the only crop is native hay, which is harvested by the large flocks of sheep, llamas, alpacas, and some cattle. This livestock is the source of the commercial income.

There are two ministries of the Peruvian government that today are attempting to initiate action programs among the Indian farmers of the *Sierra*. The Ministry

of Education is initiating an extensive educational program by opening several rural normal schools where Indian teachers will be trained for work in the area. Unlike past teacher training efforts, when rural and city teachers were trained in the same way, the new schools emphasize agricultural teaching. In the future these teachers will give invaluable assistance in carrying out a national program for the improvement of the *Sierra* agriculture. The Ministry of Development (Fomento), in which is located the Division of Agriculture, has already initiated a program of some five experimental farms—"granjas experimentales"—usually in connection with rural schools. These are doing considerable work in the field of seed improvement. Peruvian officials claim, however, that only a beginning has been made and that only recently have they become aware that the major agricultural problem of Peru is the social and economic situation of the nearly 3,000,000 rural *Sierra* Indians.

Farming on the Highland

The agriculture of Bolivia in the *altiplano* or highland plateau area where most of the population is concentrated, is virtually the same as that of the Lake Titicaca region of Peru. Indeed, as it extends into Bolivia this highland area becomes much more bleak and desolate than the region in the vicinity of the lake. In many Indian community areas it is necessary to allow the land to lie fallow twelve years between crops, and throughout the *altiplano* the struggle to extract a bare subsistence, in the form of potatoes, is everlasting. Bolivia is one of the world's richest countries in terms of mineral resources, but this mineral wealth at present furnishes a living to only some 40,000 Indian miners and their families, and the rest of the highland Indians, more than 2,000,000 of them, must depend upon the extremely meager returns from their agriculture. They produce virtually no marketable surpluses and add practically nothing to the food supply of the rest of Bolivia. Many Bolivians believe that if an adequate food supply is ever to be produced within their country, it must come from the fertile valleys or *yungas*, or the eastern regions that drain into the upper branches of the Amazon river. The Ministry of Education is the only ministry of the Bolivian government that has initiated a large scale program to deal with the problem of the highland Indian farmer.

Araucanian Agriculture

Chile has a great surplus of rural population in terms of its available land resources. Among the noncommercial farming groups of Chile are two groups of Indians, those in the northern desert area who depend upon wage work in the sulphur and copper mines for most of their living, and the Araucanian Indians in the south-central area who retain title to considerable, although diminishing, land areas in the region of Temuco. The latter utilize most of their land for growing traditional subsistence crops. Using antiquated methods of agriculture, many Indian farmers find it extremely difficult to compete with the rest of the farming population. The Indians themselves are aware of this and have formed several large and powerful organizations, chief among which is the Frente Unico Araucano, as a means of defense against encroachment.

One of the serious problems that confronts the Araucanian farmer is the problem of soil wastage because of water erosion prevalent throughout the area. Although the best able to defend their interests of all the South American Indians, the Araucanians nevertheless need all assistance possible from the Chilean Ministry of Agriculture.

In South America, Indian agriculture is synonymous with small scale noncommercial agriculture. Distinct in specific detail in each country, the general problem is how to bring about increased agricultural production, first, in order that the consumption standard of the Indian population may be brought up to a decent level, and, second, in order that Indian agriculture may increase its contribution to the national markets and thus augment the food supply of the total population.

In the past virtually all the concern of the Ministries of Agriculture of Latin America, as of the United States, has been with the solution of the many and serious problems of the commercial agriculture that furnished the exports of the various countries. An increasing number of the thoughtful students of the agricultural situation have come to recognize that the problem of the small scale noncommercial Indian farmer must also be solved, for unless the Indian majority of farmers is enabled to become a productive factor in the agriculture of several Latin American nations, it will not be possible for them to develop truly sound national economies.

Family Planting Potatoes in the Cuzco Valley, Peru.

ALONG THE *Agricultural Front*

▲Institute of Agricultural Economy Established in Chile

On August 7, 1942, the President of Chile signed a decree creating an Institute of Agricultural Economy.

The task of the Agricultural Economy Institute is to centralize and coordinate the diverse official and semi-official activities and organizations of the country concerned with agricultural production. In a limited way some of the principles on which the Institute is based are similar to those set forth for agricultural agencies in the United States under the first and second Reorganization Acts.

The new institute is governed by an administrative council consisting of the Minister of Agriculture, who presides, the Ministers of Finance and of Commerce and Economics, the Presidents of the Mortgage Bank (*Caja de Crédito Hipotecario*), the Agricultural Credit Bank (*Caja de Crédito Agrario*), and the Agricultural Colonization Administration (*Caja de Colonización Agrícola*) as well as representatives of the five most prominent agricultural societies of the country and members of the faculty of the School of Agronomy of the University of Chile.

The orientation of agricultural production and credit will be the general task of the new agency. It takes over the Agricultural Export Board, the Bonded Warehouses Service, the Cold Storage Plant Service, and the Fertilizer Council. The Institute will advise the Commissariat of Prices on questions involving production, distribution, and consumption of agricultural products; it will also advise regarding colonization, land subdivision, and the formation of cooperatives of small farmers.

▲São Paulo Organizes Dairy Experimental Station

The Secretary of Agriculture recently organized the first dairy experimental station in the State of São Paulo. A combination school, dairy, butter, and milk plant, this new Institute is located in Montenegro, a municipality containing some of the best dairy herds in the State.

▲New Minister of Agriculture Named

A new Minister of Agriculture for Chile, Fernando Moller Bordeu, was appointed on August 12, 1942, by President Ríos to fill the position left vacant by the resignation of Remigio Medina Neira the day before.

Señor Moller Bordeu is no newcomer to official agricultural circles. He was Minister of Agriculture for a number of months during an earlier Administration, and he also formerly was vice president of the powerful National Agricultural Society (Sociedad Nacional de Agricultura) which lists on its membership rolls the names of nearly all the big landowners of Chile.

The new Minister owns a large wheat and cattle farm near Los Angeles in the south-central zone of Chile. He is a lover of fine horses as may be evidenced in part by the fact that he is a director of the Chilean Race Horse Breeders' Association. The new Minister appears to know first-hand, and to understand clearly, most of the country's chief agricultural problems and because he is youthful and active will probably be a most valuable aid to President Ríos in reorganizing the Government in line with the authorization granted in the new Emergency Law.

At his first press conference Minister Moller stated that it was his aim to orientate the agricultural activities of the country for the benefit of both producers and consumers. He stated that it did not seem reasonable that a country with Chile's potential agricultural riches and only 5,000,000 people to feed should be obliged to import wheat, for example, to supplement inadequate domestic production. Señor Moller stated that in the future "we ought to produce enough to feed 20,000,000 Chileans."

▲Shark Livers for Oils and Vitamins

A new Mexican company has recently been organized for the elaboration and reduction of shark livers to oils and vitamins. Formerly all the livers were shipped in cans to the various buyers in California, but with the increasing scarcity of tin cans, livers can no longer be shipped for reduction in United States laboratories, even if the buyers could pay the new high export tax now being levied by the Mexican Government.

Operation of the new plant will commence late in the year, as soon as the necessary machinery and equipment is obtained from the United States. Its location will be at Guaymas; its function will be to reduce and extract from the shark livers the oil content and vitamins and to freeze and ship to the United States markets. Cartons or other containers more easily obtainable than tin cans, will be used. The initial pay roll of this Compañía Vitamínica y de Extracciones, S. A., is stated to contain about 50 employees, and its authorized capital will be 500,000 pesos. General Abelardo L. Rodríguez is the principal stockholder.

With the opening of the new plant, it is believed that the Rodríguez interests will be in a position to control the shark liver market on the West Coast of Mexico and that there will be no further competition from American or Mexican buyers.

▲Conference on Social Security

Nelson Rockefeller represented the United States at the First Inter-American Conference on Social Security held in September at Santiago, Chile. Delegates from all the Americas, including the United States and Canada, attended. The purpose of the Conference was to codify and extend social security legislation for the benefit of American industrial and agricultural workers. Increasingly aware of the value of economically sound and socially expedient insurance plans in bulwarking stable governments and increasing war production and national wealth, the Congress placed its emphasis on "freedom from want" and "freedom from fear."

The Congress drew up a Social Security code for all the American Republics and recommended that domestics, farm laborers and professional workers be included in social security programs. It further resolved that "the health and capacity of the workers of any one nation are the concern of all the American nations."

▲Nicaragua Develops New Crop

With the Asiatic supply cut off, sesame, first planted commercially in Nicaragua in 1937, may prove to be a valuable crop. Since there is very little oil crushing and processing equipment available in Nicaragua, however, the sesame crop must be handled in seed form. Difficulties in shipping and marketing may result, for the seed is bulky and spoils if stored for too long a period.

▲United States—Bolivian Economic Agreements

The outstanding economic event during the month of August in Bolivia was the signing of the agreements in Washington which will serve as the foundation for the United States program of financial and technical assistance to Bolivia. The Minister of National Economy and the Minister of Finance returned to La Paz to announce that the two Governments had agreed on the nature and amount of loans to be made to Bolivia as well as the form which the Bolivian development would take. The United States program includes development of roads and assistance to agriculture, mining, and the petroleum industry.

▲Venezuela Establishes Agricultural Colonies

Through an agreement signed by representatives of the Venezuelan Government and the principal oil companies operating in Venezuela, agricultural colonies will be established with the assistance of the latter. These colonies, which will be occupied by discharged employees of the oil companies, will be located in two zones set aside by the Venezuelan Government. One of the zones is situated in the State of Monagas, to the west of the Caripito oil camp; the second is in the State of Zulia.

Colonists settling on these lands will be granted plots of ground not smaller than 10 hectares nor larger than 15 hectares. The colonists will be granted full title to their land parcels if, at the end of a 3-year trial period, they have fulfilled all the criteria established in the agreement between the Government and the oil companies regarding the conduct of the workers.

▲Argentina Encourages Olive Cultivation

Argentina has created a national corporation to develop olive cultivation. Administered by an Executive Board under the Sub-secretary of the Ministry of Agriculture, Doctor Carlos Alberto Erro, the new corporation will be responsible for organizing the production and sale of olive trees, supplying growers with technical advice and instruction, and organizing the industrialization of olives through the establishment of regional processing plants. Credit facilities amounting to two million pesos will be placed at the disposal of the Corporation for the equipment of nurseries.

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Ernesto Jaén Guardia

OUR MUTUAL FRIEND

Panama, the youngest of the American republics, has almost the oldest history. Since 1502, when Columbus on his fourth voyage explored the Caribbean coast of Panama in his search for a way through to Cathay, the Isthmus has been perhaps more frequently the center of world interest than any section of the two continents it connects. Very soon after its discovery, that narrow strip of land became the center of the western world of commerce and of Spain's great economic empire. The enormous wealth of the Peruvian Incas was transshipped at Panama; there the imports from Spain were distributed among the Spanish colonies; to Panama came the fishers for pearls. Named from an Indian word meaning "abundance of fish," Panama has indeed been a land of abundance. Strategically located for ocean trade and a junction point for air traffic, Panama's future history promises to be as notable as her past.

On November 17, 1941, Señor don Ernesto Jaén Guardia, newly appointed Ambassador of Panama to the United States, presented his letter of credence to President Roosevelt.

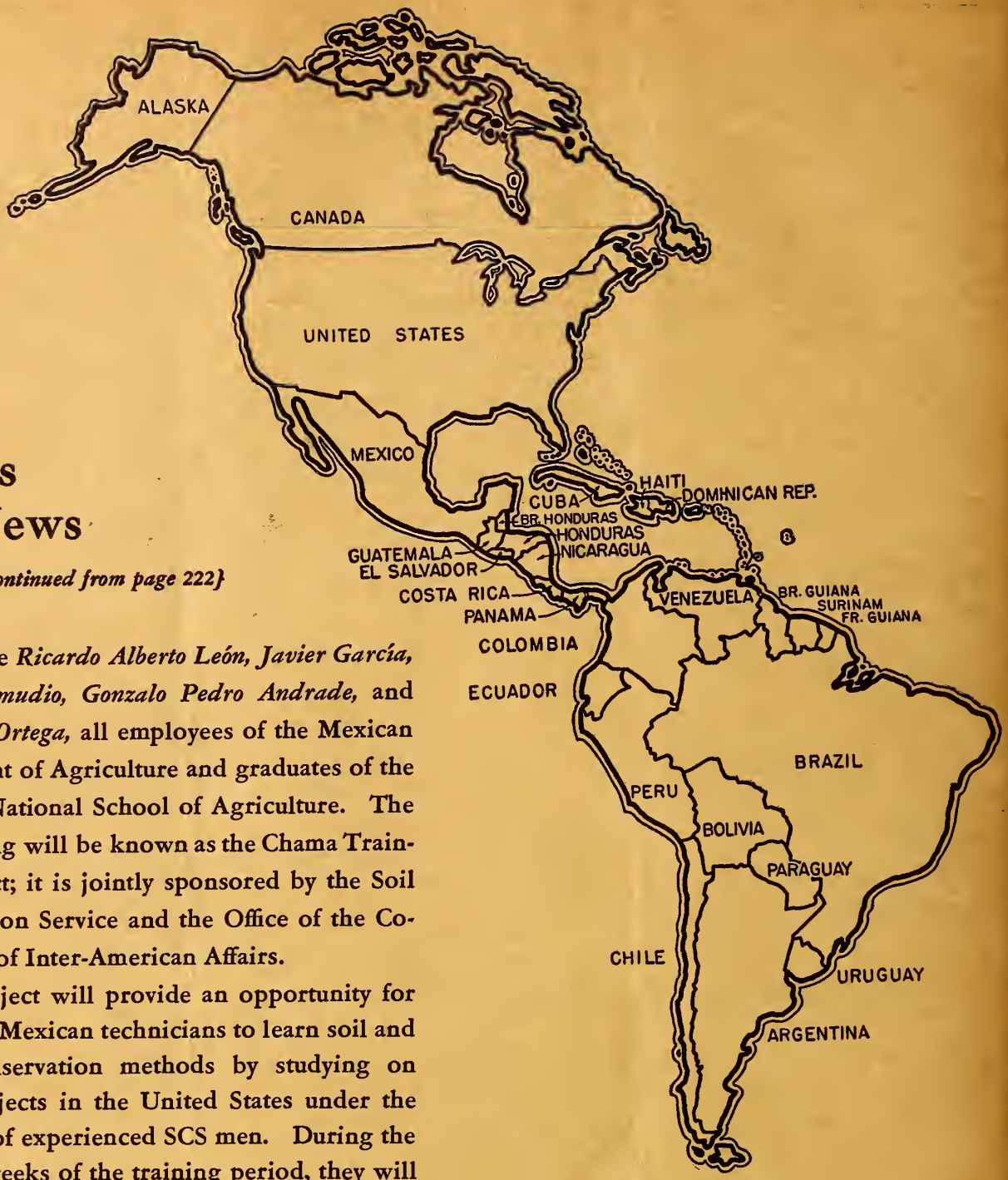
Panama's new Ambassador was born in Antón, Province of Coclé, Panama, in 1895. After his early education, first in his native province and later at the School of Arts and Crafts in the capital, he attended the University of Michigan and the University of Illinois, from which he was graduated in 1921 with the degree of Bachelor of Science in Architectural Engineering.

During the years from his graduation to 1935, Señor Jaén Guardia was engaged in the practice of his profession in the United States, in Panama, and in the Canal Zone. In 1935–36 he was the Director of the School of Arts and Crafts in Panama; in 1936–37 he served as Chief of the Internal Revenue Office; from 1937 to 1938 he was Superintendent of Santo Tomás Hospital; and from 1938 to 1940 he was Secretary of Health, Welfare, and Public Works. After service as Panama's Minister to Mexico and the three hours on October 9, 1941, when he was President of Panama, Señor Jaén Guardia was named to his present post as Ambassador.

Señor Jaén Guardia has also served as Panama's official delegate to several Inter-American conferences—the Third Pan American Highway Congress at Santiago, Chile, in 1939; the Fourth Pan American Highway Congress and the Second Inter-American Travel Congress at Mexico in 1941. He is a member of the Panama Society of Engineers, the Alumni Association of the University of Illinois, Phi Chi Delta, and the American Society of Civil Engineers. As Panama's ambassador and as Panama's member of the Governing Board of the Pan American Union, Señor Jaén Guardia is a distinguished representative of a friendly nation.

Names and News

{Continued from page 222}



trainees are *Ricardo Alberto León, Javier García, Emilio Zamudio, Gonzalo Pedro Andrade,* and *Humberto Ortega,* all employees of the Mexican Department of Agriculture and graduates of the Mexican National School of Agriculture. The undertaking will be known as the Chama Training Project; it is jointly sponsored by the Soil Conservation Service and the Office of the Coordinator of Inter-American Affairs.

The project will provide an opportunity for the young Mexican technicians to learn soil and water conservation methods by studying on active projects in the United States under the guidance of experienced SCS men. During the first few weeks of the training period, they will study the general principles of soil and water conservation. Later, they will acquire individual proficiency in technical work and in organizing and administering a conservation program. Included in the training program are occasional trips to agricultural colleges and to various parts of the Southwest. After the students have completed their work in New Mexico, they will re-enter the Mexican Department of Agriculture in positions where their knowledge may be used to advantage.

The Chama Training Project is part of a nation-wide program of soil and water conservation training for technicians and students from the other American Republics.

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UNITED STATES DEPARTMENT OF AGRICULTURE

OFFICE OF FOREIGN AGRICULTURAL RELATIONS

Agriculture IN THE *Americas*

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